Welding Is Easy! See Page 38

CAR CRAFT

The SHOW-HOW Magazine

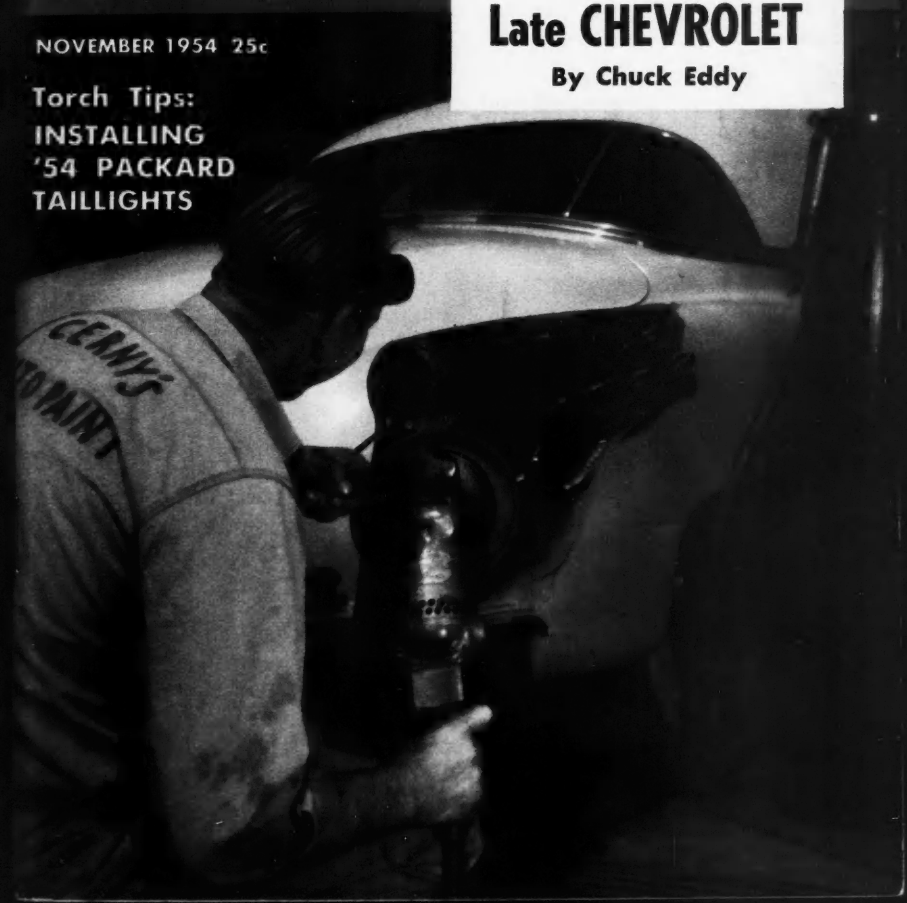
CUSTOM CARS • HOT RODS

NOVEMBER 1954 25c

SOUPING the Late CHEVROLET

By Chuck Eddy

Torch Tips:
INSTALLING
'54 PACKARD
TAILLIGHTS



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COVER

In line with this month's Torch Tips feature, George Cerny puts the finishing metal-work touches on a Packard taillight installation on a late model Olds. To see how he did it, check pages 38 through 43. *Ektachrome by Tom Medley*

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BRIEF AND TO THE POINT:

268 Words From The Editor

OWNERS of that other low-priced car should be happy this month. We've succumbed to the queries of this tribe and actually come right out and admitted that there is another car besides Ford. We've even gone out on a limb and admitted GM's little Six can be given the treatment. Chuck Eddy tells how in the lead article starting on page 10.

Another thing that we've never seen in any automotive magazine is a good comprehensive *and simple* story on welding. This we've got this month. We followed the directions with a neighbor's torch the other day and where we used to wind up with about half slag we actually got a good bead the first try. You can do likewise if you pay attention to pages 18 to 23.

Among the many and not too well defined editorial policies of CCM is one which comes under the heading of "The Buck and how to save it." A story that falls into that category is this month's Garage Gimmick by Dean Moon. Deano comes up this time with a little epic on building an air compressor. As most folks know, such items are priced between two and three hundred of the best. This one, with small effort and a little scrounging, can come into your garage for the grand total of $30, repeat, three-oh dollars. If you have to spend more, your local salvage operator has probably read the story too, and priced his wares according to the expected demand.

Speaking of dollar saving, check out pages 32 to 38 for an idea along these lines.

THINGS TO COME

A FOLLOW-UP on this month's welding story, we thought you'd like to know the ins and outs of using a cutting torch; believe us, it isn't quite as simple as it might seem to some nor as hard as it might appear to others. Next month we'll show you just what we mean.

In the eastern states roadsters are not too plentiful, particularly for the rugged treatment received on quarter and half mile tracks. We've waited for a long time for someone to come up with a good story on building a modified stock such as the boys run throughout that half of the land. Finally we took matters into our own hands and assigned Ed Monroe to the task. For the next few months, we'll be able to show you all the shortcuts to building a short circuit bomb out of that '37 through '40 coupe. Ed has also come up with a goodie on modifying the Stromberg 97 carburetor for use on cars other than Fords. If you're in the backyard speed equipment business, don't miss this one.

Chuck Eddy also finishes out the Chev-GMC story next month with the story of how a full-house competition Sprinkler Six goes together. Stove Bolt fans should definitely check this one out; it's the most.

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LETTERS

DOT'S DREAM BOAT

Dear Sir:

Just finished an old copy of CAR CRAFT I found in my brother's room and gosh it's wonderful. From now on I am a constant reader of CAR CRAFT.

I have a '36 Ford sedan with hydraulic brakes, white wall tires, a '48 Ford truck engine and, of course, extras such as radio, heater, spot light, '49 Ford grille guard and '49 Chevy bumper guards on back. It's painted Washington blue. I have enclosed

a snapshot, and would be thrilled to see it in print.

I love good looking cars and having nothing but brothers who are real hot rodders, maybe you won't think it strange for a girl to love cars as I do.

Looking forward to seeing my Ford in print.

Yours truly,
Dot Honea
Doraville, Ga.

IT WORKS!

Dear Sirs:

I have made up two "Hot Ignitions" after reading the story in CAR CRAFT.

My partner used one of them on our dragster on July 5th at Shelton, Wash. He took the Class A championship Drags for Washington and Oregon on Pump gas. We had the hot engine torn down so we used the engine out of our pickup truck. It had 15,000 miles on it, but we eliminated cars turning 125 mph in the time trials. We put one of these ignitions together and set it on the machine and used it at Shelton the first time.

Sincerely yours,
Clint Hansen
Blaine, Wash.

METEOR FORD

Dear Sirs:

Congrats on one of the finest magazines in the business! . . . and I still think your April '54 issue was the best. Re your "Grab Bag" section on page 54, how about adding the enclosed shot to that bag?

The picture enclosed shows my 1952 Ford with a '52 Meteor (Canadian Ford with different trim, Merc block and dash) grille. The three-piece grille is basically a straight

bar, with a centerpiece assembly of three chromed teeth or ridges. The grille fits into the same holes that the old Ford bullet center spinner occupied, and yet, while it is mainly a straight bar, it is an interesting variation. The hubcaps are chrome Meteors also, as are the tail lights. The hood, trunk, were dechromed completely, and all writing was removed from the side. The "V-8" was relocated, and the pace car flags were installed. Several pieces of chrome were added to the sides where I thought they would do the most good. A tan paint job, dual exhaust system, and a mild lowering job complete the exterior. To go with a reworked Fordomatic (very slight, but enough), I plan to add ignition, a cam, and heads very soon.

Sincerely yours,
O. A. Goessl
New Orleans 24, La.

REBUTTAL

In answer to the letter by Bob Blosser of Warsaw, Ind., in the September '54 issue of CAR CRAFT. As he had them numbered:

1. Cheap paper—It isn't so cheap a paper as you may think. Even if it was cheap it's stuffed full of good material. If it takes cheap paper for CAR CRAFT to put out a darn good magazine, who are you to kick?

2. Hill climbs, trials, etc.—They are a heck of a lot of fun and I'll bet you have never been on one, Bob.

3. Time, paper and money wasted on good instruction—But not to a lot of people, Bob. Wish I had had a good sheet when I put my first lowering kit on.

4. Customized MG—I own a 1953 MG, and I wouldn't customize it for the world, but I read every word of the article. Well written, too, wasn't it, Bob?

5. Cisco—Not a page wasted, Bob, but a page a lot of people missed this month.

Bob, I just can't figure out why you gave such a good magazine such a hard time.

I hope my letter will be published but I am sure that many others will come to bat for CAR CRAFT.

Thank you, CAR CRAFT, for the best on the stands.

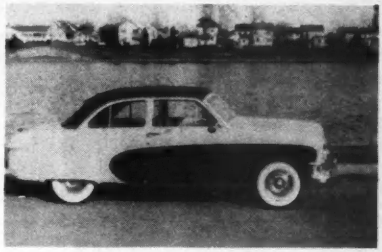
S/sgt. Jack P. Ireson
Randolph Field, Texas

Thank you, Jack.—Ed.

A PAIR OF EIGHTS

Dear Sirs:

We have been reading your magazine for the last eight months and found it excellent.



Enclosed are two snapshots of our bombs which I hope you will print. The Victoria has a four-barreled Buick carb and has been dropped a couple of inches. The convertible has been lowered; duals, heads milled down

and dual-point ignition are its only assets up to now.

Sincerely,
Bob O'Mahony and George Bahey
Wee 8's
Stratford, Conn.

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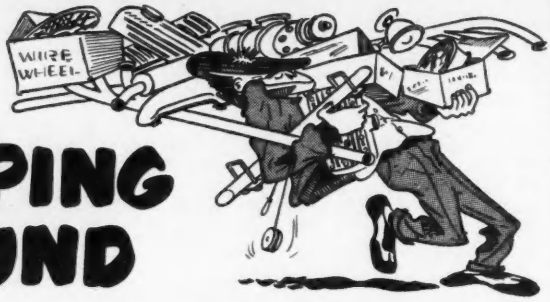
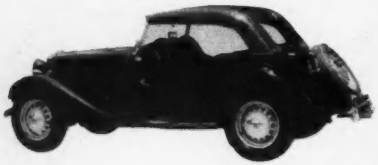


SHOPPING AROUND

NEW HARDTOP

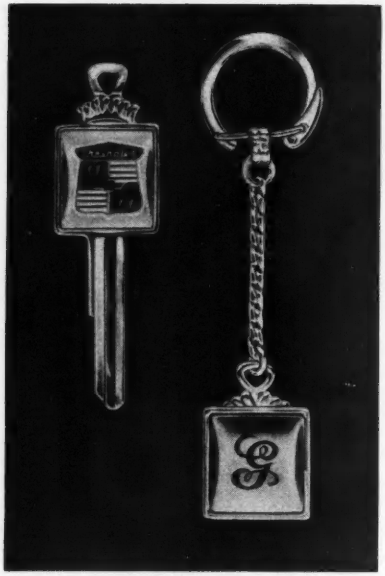
THERE ARE approximately 600,000 MGs in the United States. Some of these are *not* in Southern California and for the latter, here is a nifty new item. It's a new Fiberglas hard roof weighing just a shade under 21 lbs. Attached with four wing-nuts, it can be removed or installed in 30 seconds flat. One



of the neatest things about it is that it can be used with the regular rag top in place, folded down; even the stock side curtains fit. Colors are red, blue, green, black and white, all impregnated into the laminate so that it won't scratch or chip. Price is $110.00 plus state taxes, if any, FOB San Diego, California, from Scott's Top Shop, 1327 State Street, San Diego 1, Calif.

KEY AND CHAIN

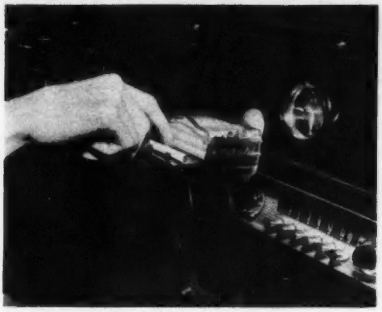
A SIGNET auto key and matching key chain which can be personalized with the buyer's initials and/or the heraldic crest of his automobile is being marketed nationally by the National Key Company of Cleveland, Ohio. The signet keys and chains will be sold in department stores, variety, drug, chain, auto supply stores, etc. The auto key and matching jeweler's snake chain are finished



in 18 Kt. gold over solid brass. Key with heraldic emblem or initial will sell for $1.00. Key chain, which can be purchased individually, will sell for 75¢ with emblem or initial.

CIGARETTE DISPENSER

KEEP your cigarettes fresh in a dispenser with a humidor designed to stick on front or top of dash with suction cups. Place water or fruit in the humidor to keep them fresh. A simple pull on the drawer, a single cigarette pops up in a cradle for easy picking. Play safe—keep them handy. Holds 20 ciga-



rettes. $1.00 prepaid. Frederick Novelty Company, Dept. 142, 1403 Keller Ave., Richland, Washington.

FOR HOT HEADS

YOU can now buy your own personal "air-conditioner." No power is required. There are no installation charges. And you wear it on your head! This latest contribution to hot weather comfort is an attractive cap made from Du Pont cellulose sponge. Worn while wet, it retains its coolness and moisture for many hours, depending on the heat and humidity. The cap, which cools the wearer as the moisture in the dampened sponge evaporates, can be immersed in water as often as necessary. Retail price of the "Kool Kap," made by the Kay-Gee Corporation, Milwaukee, Wisconsin, is approximately $1.95. It is sold through drug, department, and sporting goods stores, and by industrial and hospital suppliers.

STROKED SHAFTS

WITH many of the new crankshafts coming through made out of nodular iron, stroking becomes a problem. Chewing off metal actually weakens the crank to such an extent that it can snap under moderate load. Consequently the various stroking outfits have been scurrying around trying to find a way of adding metal and making it stick to the nodular iron. One of the ones to find such a process is The Crankshaft Company, Los Angeles. They claim they can safely give any stroke increase within reason through their new welding process, the patent for which is pending. Complete crank, rod and piston assemblies are available for the Merc at $285 and for the Cadillac at $384 for a complete set-up. Write The Crankshaft Company, 1422 South Main Street, Los Angeles 15, Calif.

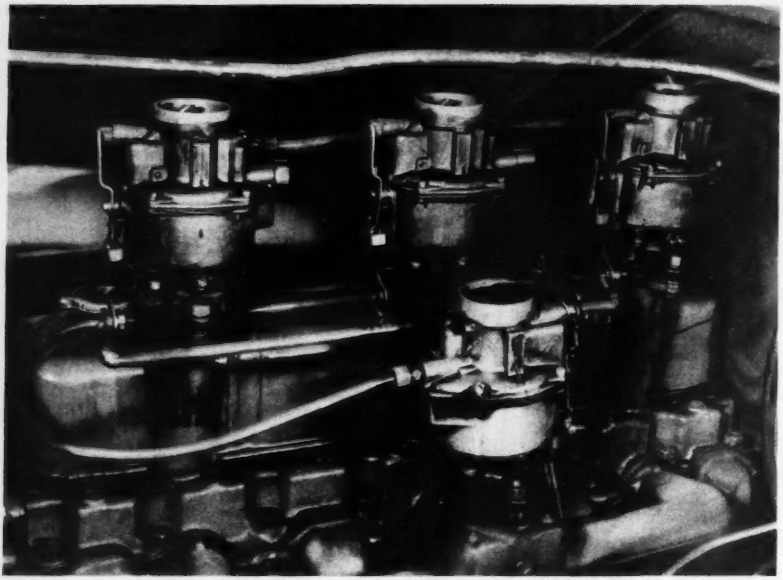
SMALL SPRAY GUN

FOR small (very small) touch-up jobs or finishing trim, the new vibrator motor-powered spray guns are just the ticket. These units are self contained with the power source inside the cap, no air hose being needed. This is one of the first, made by Burgess. All you do is unscrew the jar and fill with properly

thinned enamel or lacquer, stuff it back together again and pull the trigger. The spray nozzle, being critical on these low-pressure jobs, is made of synthetic sapphire, like a watch jewel, preventing nozzle wear. The Burgess sprayer is available in most hobby shops or from the Conlin Company, Elm Street, Bridgeport, Connecticut.

OIL SPRAY

EVERY once in a while you come up with a problem in which a spray, rather than a squirt, of oil is just the thing to solve everything. The answer is in the pressurized "bug bomb" type of can. The 3-In-One outfit, noted for home-type oiling goodies, has come up with just such an item. The pressure can of oil should be ideal for freeing up tight nuts and bolts and reaching otherwise inaccessible spots. Should be good for spraying rust preventive oil over guns and other sporting equipment, too. The pressure oiler is available in hardware stores, drug stores and supermarkets for 75 cents.



While hardly falling under the "conservative" category, Bob Palmini's street-competition engine shows what can be done in the way of progressive carburetion. Single pot acts first.

The Chevy Caper

PART I

By Chuck Eddy

THAT OLD standby of the overhead clan is the subject of our interest this month. As Chevrolet has probably produced more overhead engines than any other manufacturer, there are many enthusiasts owning them who didn't buy them for the same reason as that retired school teacher from Pasadena. For these souls in search of power, we have attempted to sift through much information and come up with the simplest procedures for building engines for two different purposes, Conservative (Bomb in the Family Bus) and Competition (Drag-Strip Menace). Assuming also that your pockets are not strained with green stuff, we'll keep an eye on the costs of the proposed incendiary undertaking. Before you begin, save yourself considerable mental strain and later disappointment by understanding the problem of using an engine that is small by comparison with the large V-8's of the GM family. Make the best use of the characteristics of the engine which are tried and true, and eliminate the bottle necks to horsepower which are typical of an engine noted more for its dependability than meteoric performance. This month's installment will cover the Conservative approach only.

The Bottom End

Many accusing fingers have been pointed at Chevrolet's spray and splash system of lubrication when the blame for difficulties with the lower end should have been placed on careless assembly methods. If you intend to take more out of your engine, assure yourself that the lower end has had the benefit of careful fit-up with plastigage to assure uniform clearances. As oil flow to the bearings is dependent primarily upon a "tight" oil pump, buy a new one if there is any doubt about the one you have. Before you decide what direction your build-up is going to take, ask yourself these questions:

1. How much am I going to be able to spend?
2. What mileage has the engine now?
3. Am I going to raise my compression above 8:1?

If your engine is ready for rebuilding anyway, figure that you can afford to go farther on modification of the lower end than could otherwise be justified. Question number 3 does not in any way infer that the stock lower end will not tolerate squeeze above 8:1, but rather that you should remove all doubt by complete modification if you are seriously raising compression pressures.

The method of setting rod bearing clearances as given in the Chevrolet Shop manual is to remove shims until the rod can just be tapped back and forth sideways on the journal with a soft-faced hammer and then *adding* a .002 inch shim on *one* side, between the cap and rod. This should result in a clearance very near the stock specified limits, .001-.002 inch. However, this method *can fail* to produce satisfactory clearances unless the rod alignment is perfect. To assure that your rods are not accidentally cocked during assembly of the pins, follow this tip of Harry Warner, the Maestro of Wayne Manufacturing. Instead of holding the rods in a vise while tightening the pin clamp bolt, insert a punch or rod *through the pin* and use it to counteract wrench torque. While we realize that tightening force on the clamp bolt will not bend the rod much, avoid any possibility of its occurrence by using this procedure.

While engines of 1948 and later employ insert type mains, we do not recommend that these be fitted by the manual procedures, unless align-boring facilities *are not* available. As the ability to maintain a free-turning, long-lived engine is dependent upon both close tolerances and perfect alignment, money spent on align-boring is undoubtedly better invested than in a comparable amount of speed equipment. Only the best quality babbitt should be used; we do not recommend either cadmium-silver or "hard" diesel babbitt

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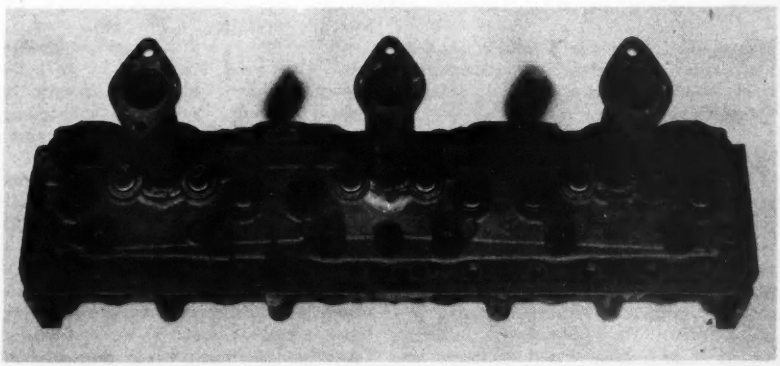
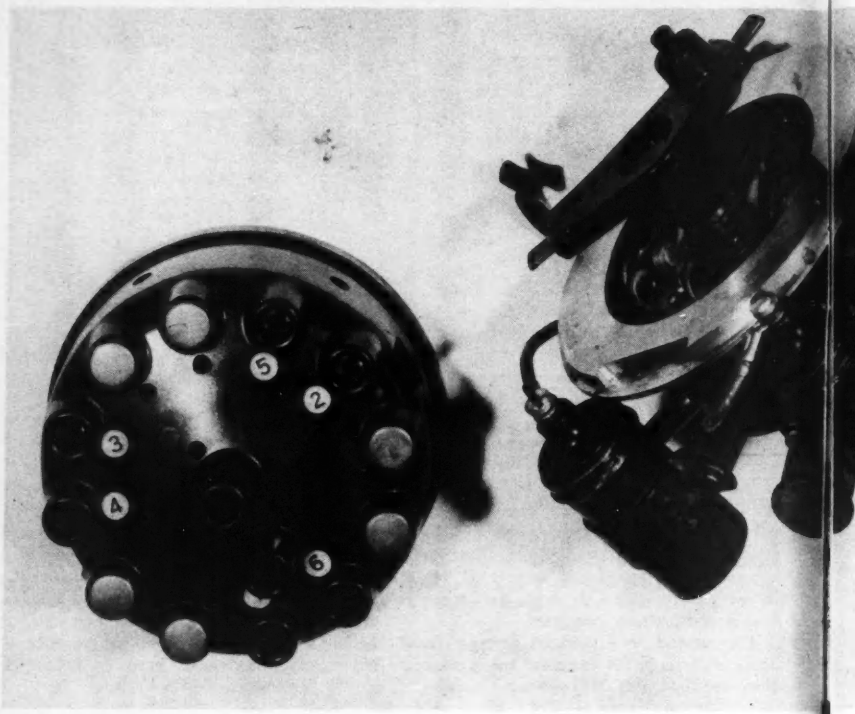


Close-up of Palmini's head shows how extra carburetor stacks are let into intake ports.



For the conservative and not-so-conservative is the Spalding conversion from Nash igniter.

THE CHEVY CAPER continued

at this point. With a well fitted crank in a block with mains at close stock clearance, the crank should be easily revolved by hand, without effort.

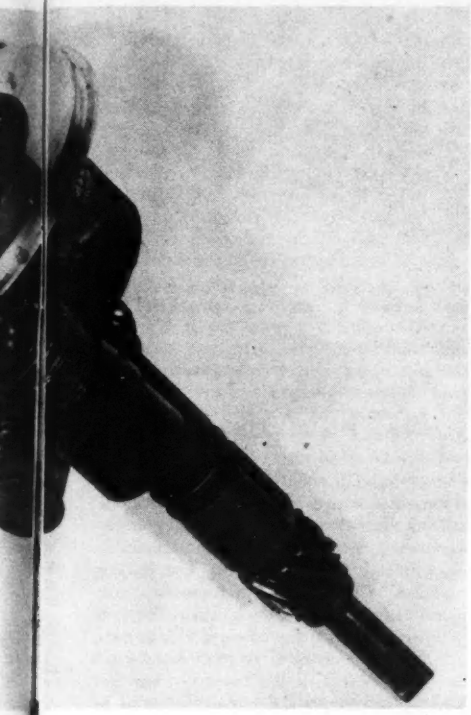
Additional Changes—Lower End

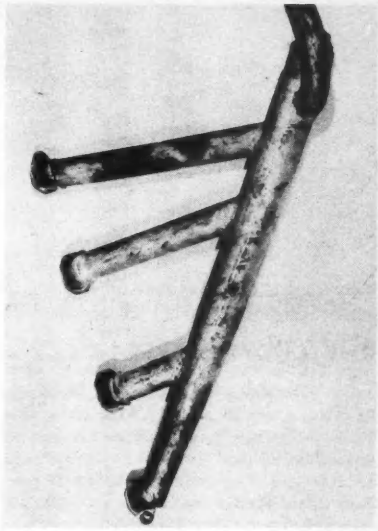
For an additional charge of about $15 it is possible to have your Chev crank drilled for pressure to the rods. If this is done, the rods will have to be altered for pressure by plugging the cap oil inlet hole with a ⅛ inch pipe plug and the escape hole, on the upper curvature, with a 10-32 screw. Another desirable option is the installation of rods bored to receive precision inserts, a common replacement item for Chevrolet, obtainable from most engine reconditioners or CAR CRAFT advertisers.

The inserted rods may be used with either splash or pressure installation by using the standard dippers with splash troughs, or plugged holes with pressure, as explained before. We had better be careful, we're getting less "Conservative" at every step!

If you are modifying a fairly new engine and staying ultra-conservative on the top of the engine, at least make sure that the stock oiling system is functioning at full efficiency. Most important is the "targetting" of the spray nozzles in the troughs, and other dimensional relationships in the pan plumbing. For a charge of about $1.50, your nearest Chevrolet dealer can check all these relation-

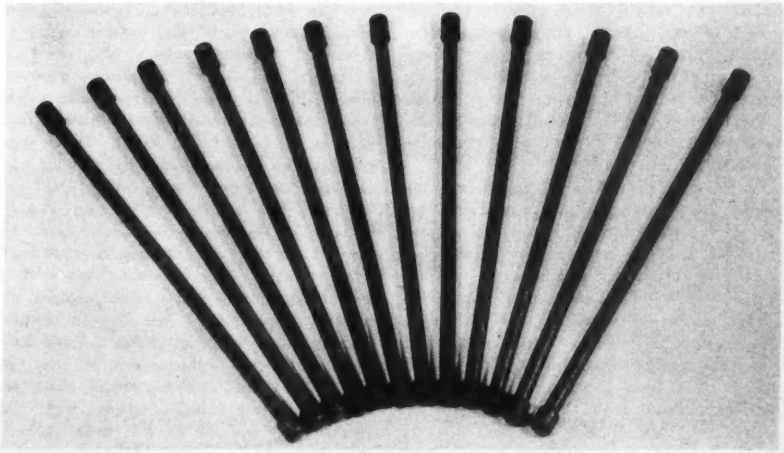
(*Continued on page 14*)

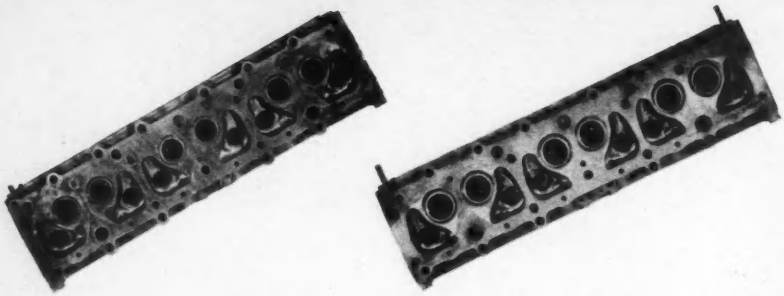




Street and racing headers for the Chevy are easy to make. No compound curves needed.

Light weight tubular push rods like these are available for all models '37 thru '54.





Cleaned but unmilled head is at left. After milling, the head is relieved as shown at right. This head has been cut .125 in. This is considered to be maximum for general use.

THE CHEVY CAPER continued

ships with gauges. So we can not be accused of missing any bets, we'll also warn you not to let the pan lie around on the garage floor gathering dust and dents while you're building the rest of the engine. The whole bearing system is very vulnerable to "build-in" dirt. Because of this vulnerability, many bearing failures start with the careless Joe doing the assembly. Top off this clean, careful lower end assembly with the specified torques of 55-60 foot pounds on the rods and 100-110 on the main caps and you'll have a job that will give long and fast service with no headaches.

Some builders have bought G.M.C. pumps with the mistaken idea of using them in a splash installation. It won't work, because the longer G.M.C. pump interferes with the splash plumbing. Another point worth mentioning is the enlarged radius of dipper travel producing interference when a high torque engine (or $3\frac{13}{16}$ inch stroke crank) is installed above a standard pan. You must use a high torque pan!

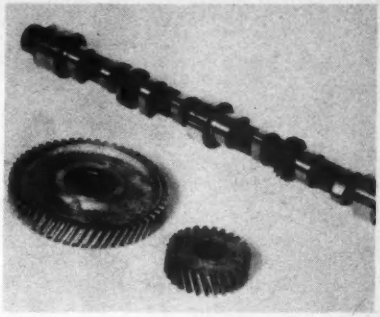
A most unique feature of the Chev oiling system not appreciated by the casual onlooker is that the supply to the oil nozzles is actually the spill-off from the pressure relief valve for the main bearings.

Thus, it would be possible to seriously decrease oil supply to the rods by shimming the pressure relief valve spring, in the mistaken assumption that this would then increase main bearing pressure. Setting main bearing clearance too high, .004 inch, also deprives the rods of some essential flow by by-passing too much out the mains. Don't shim the relief valve spring *at all* unless you're running a full pressure system and even then use restraint!

Pistons and Head

We're covering these in one category as they go hand in hand to produce the desired compression ratio. The design of the Chevrolet combustion chamber, although producing maximum combustion smoothness, is so deep around the exhaust valve that shaving produces relatively small compression ratio increases for a given milling depth. Thus, the increases produced by milling a wedge chamber .060 inch might be up to ½ ratio, while on the Chev it is nearer ¼ ratio or *less*. For this reason, you should gain compression by both bore increase and milling the head if you can not afford the compression raiser pistons. However, if your present engine is about out of breath anyhow, why not bore it larger and install aluminum pistons? You'll kill four birds with one stone; bigger bore, lighter aluminum pistons, higher compression, no wild head milling. These slugs cost between $32 and $40 a set, without pins or rings, and look to us to be the best answer to a real performance increase. The alternative to this preferred method would be any of the excellent replacement aluminum *flat-top* pistons used in conjunction with a milled (not filled) head. Quite popular for head raw material are the 1937-40 models, because of the more extensive milling their thick under side will tolerate. We are told that up to ¼ inch *can* be removed. However, consider that it is necessary to "sink" the intakes the amount of the head mill to maintain valve to piston clearance and you

will understand why it's better not to go overboard on the chopping. This clearance is partly necessitated by the fact that the distance from the valve head to the piston will decrease during the part of the stroke when the piston is already near top center with the valve already opening! If in doubt at this point, insert a small blob of modeling clay on top of the piston opposite the intake valve. Bolt the head down with an old gasket, install the valve train and rotate the crank through *two turns*. Measure the thickness of the thinnest section of the clay impression and hope that it is 1/32 inch or thicker!



Old style GMC cam and timing gears should not be used on Chevy, causing 10° retard.

Head—Valve Installation

Valve spring tension must be restored by inserting spacers the thickness of the sinking operation against the head and under the valve springs. The installed length of the springs should measure not more than 1 13/16 inches from spring retainer, bottom edge, to spring seat or spacer on head. The standard test pressure at this length is 54 pounds. Use of additional 1/32 inch spacers will produce from 4 to 6 pounds increase for each one used. Maintain a height of 2 1/2 inches from the intake valve stem to the cylinder head surface by grinding the stem ends. Extensive sinking operations increase this height and destroy proper rocker-to-stem relationships, which might cause intake valve stem binding. Sinking operations should be carried nearly to the required depth then completed by grinding the intake valve seats to produce the

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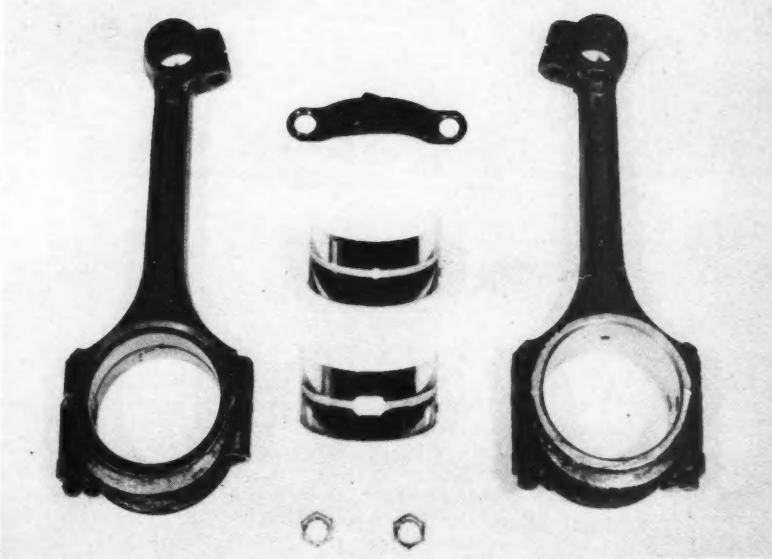
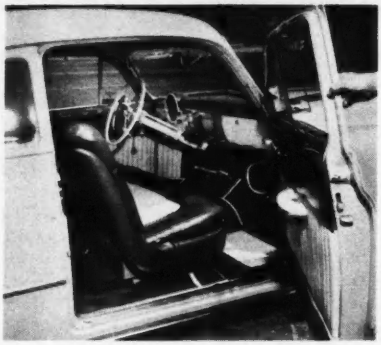
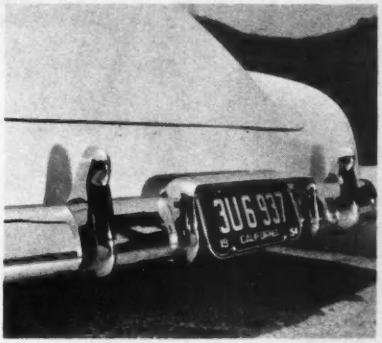


Stock rod is on left, rod on right is bored for insert bearings shown with dipper, center.

Text and Photos by Dick Day

ALL CUSTOM car owners have one mutual thought and that's to have their car different in appearance from others. Some go to great extent to restyle the original body if the personal pocketbook is big enough, while others, not so flush, fitting the conservative category, have to rely on clever grille and minor restyling to come up with the different look. Dick Ward of Long Beach, Calif., has done just this and has come up with a Chevy two-door that you don't see in your every-day travels. Dick's Body Shop of Long Beach is credited with the exterior body work, while Gaylord's Upholstery Shop did up the interior in fine order. Dick's answer to the complete job was, "Investment-wise I'm satisfied, and I have yet to see another car resembling it."



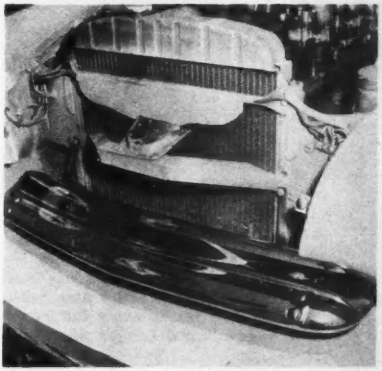


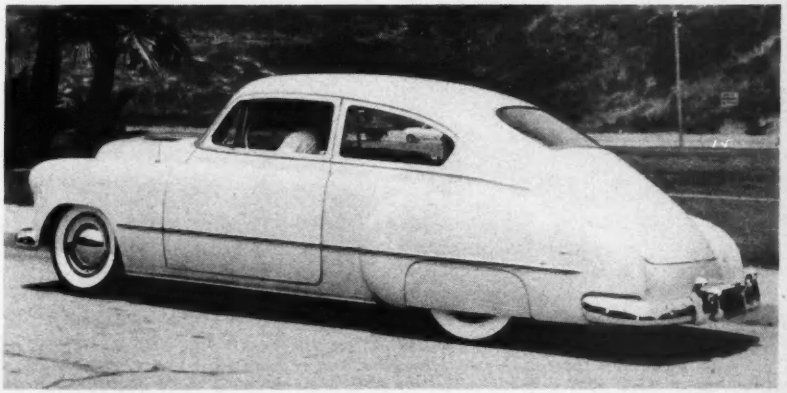
Color combo of interior is green and white. Seats have large front roll while doors and quarter panels carry roll and pleat motif.

Stock taillight openings have been filled in and taillights incorporated into the bumper guards (CAR CRAFT, April '54).

Floating grille bar is from '52 Olds. It is mounted solidly with two iron straps. Late Merc grille shell is built into hood.

Rear section of side trim is from '50 Pontiac. Rear frame has been stepped and front A-arms cut to lower car a full 4½-in.





WELDING IS EASY!

All it takes is practice

Photo Story by Bob Lee

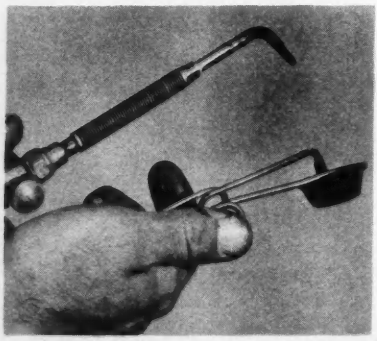
This is the "amateur's size" tank set. Tanks are $40 a pair, refills, $5. Carrier is extra but recommended and can be homemade.

Editor's note: We wish to thank Gordon Duff, Inc., Los Angeles, for their help in supplying information and welding equipment for this story and the Valley Custom Shop, of Burbank for the practical illustrations and the welding information which they gave.

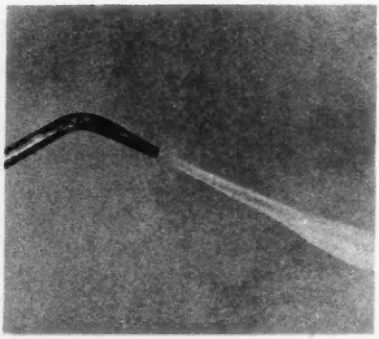
EVER HEAR of a guy restyling a car without a welding torch? Of course not! Scarcely a part of a custom, dragster or lowered street machine has been modified without welding. Imagine modifying a frame or body without a welding or cutting torch. If you've ever considered rebuilding a car you know the importance of welding.

But what about welding? Is it easy or do people take it for granted?

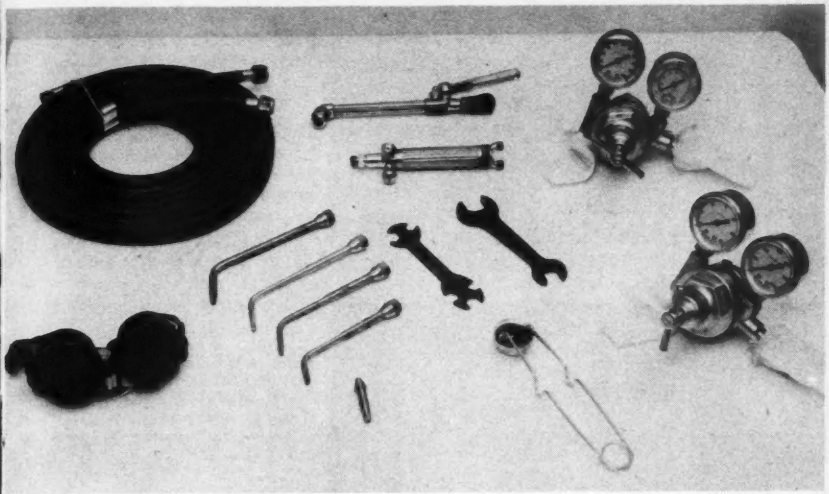
Welding functions on the principle that acetylene gas, when mixed with controlled amounts of oxygen, will produce a flame so intensely hot even the most refractory metals can be melted or fused with it. It can fuse



To light off the torch, barely "crack" the acetylene knob (less than one-eighth turn), then cast a spark with a welder's lighter.



The flame will then take off. Open the acetylene knob until base of flame is about 1/8 inch out from the orifice in torch tip.



Here is what you'll need for a complete home welding outfit, including hoses, four welding tips and one cutting attachment. The gauge-and-regulator sets are absolutely vital.

two pieces of metal together or it can cut one piece into many.

It began in 1895 when a French chemist named Le Chatelier discovered the intensity of the acetylene-oxygen combination. Digging into the commercial aspects of the scientist's discovery, other workers soon devised methods of controlling the flame and by 1903 commercial torches were on the market.

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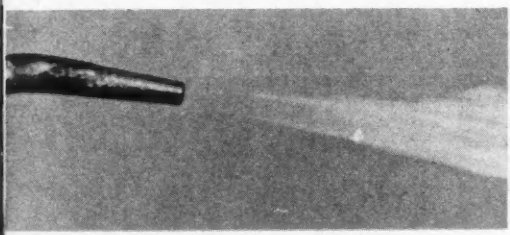
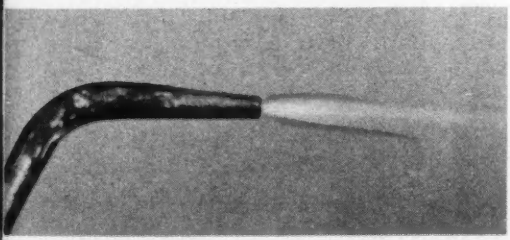
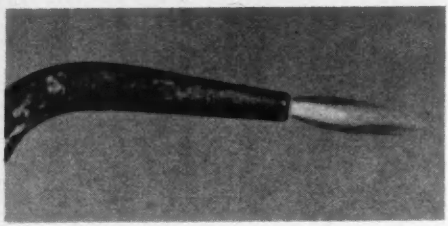


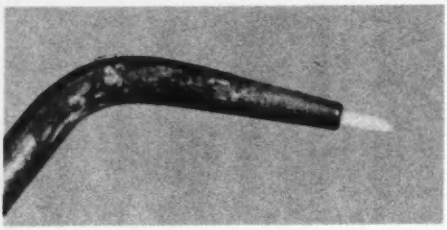
When the flame gets to this point you are ready to start feeding it oxygen, but crack the oxygen valve slowly. Too much will blow it out.



Open the oxygen valve slowly. A double flame as shown here will appear. Further opening, still slow, will shorten the outer flame.



Cone may be adjusted for maximum heat. As the oxygen is fed the 2 cones will start to unite, giving the "soft" flame shown.



Final adjustment will produce this tight flame which is ideal for fusion welding. A brazing flame is just a shade "softer."

Since that time techniques have developed and expanded, but the basic principles remain extremely simple.

Two edges of metal are brought together. The joint is heated by the oxy-acetylene flame and the two pieces of metal are fused into one piece. It can be done without welding rod, since all the rod does is supply additional metal to fill between the two pieces. If the metals could be butted together tightly, there would be no need for welding rod.

Welding seems simple enough, but is it? You've seen hundreds of guys do it. They turn a couple of valves, cast a spark at the tip of the nozzle and—boom! . . . there's the flame. Let's see how everything operates.

There is no single part of a welding set which is more important than another. With this in mind, let's begin by examining the blowpipe—that's right, the blowpipe. Confused? You needn't be. Most people call it the torch, but inside the handle are orifices which blow and mix the two gases into a regulated combination and the handle is, technically, a blowpipe. At the end of the blowpipe, or torch, is the welding tip. This is the part which does the work. It is removable, for there are many sizes of tips.

You can purchase a variety of tips, about ten in all. Each is designed to fit a specific size of metal. They run from very small to extra large. The smallest size is designed for use with 28 to 18 gauge metals and the largest commercially available is for use with $\frac{3}{16}$ to $\frac{7}{16}$ metals.

It is impossible to give a comprehensive table of tip sizes and metal gauges, since nozzles are not measured by the orifice diameter. Instead, each manufacturer has a different code number for the sizes. It is best to purchase three to five tips designed to fit the size metals you commonly use. Your dealer can help you pick these.

There are two types of tips—welding and cutting tips. Each is designed for a specific operation. The basic torch is designed solely for welding but a special attachment can be purchased to convert it into a cutting tool when necessary. Do not use a welding tip for cutting. The excess heat and extra oxygen required for cutting will ruin the tip. The welding tip will require additional oxygen to cut which is not economical. Use a cutting tip for cutting and the welding tips for welding.

Keep the tips clean. If they become clogged, through metal which has stuck to the tip, or

from dirt, they should be cleaned with a twist drill. Select the drill of the proper size and force it through the orifice. The opening should be free since it is the device which finally regulates the flow of gases.

The gases enter the torch from hoses which are connected to the cylinders. The same gases are used for all welding and cutting operations. There are many types of welding operations but only two are commonly used in auto work. These are welding and brazing or bronze welding.

Welding has been described as a fusing of two metal pieces. Bronze welding differs from this. It is more like soldering and is used to provide a solid joint between two metals which have different melting temperatures than the temperature of the bronze rod or which have different temperatures in themselves.

The two metals are heated sufficiently to support the rod in molten form, even though this temperature is below their actual melting point. Then, the rod is fluxed to help it bond, and the rod is melted over the metals. When it cools it will bond enough to provide a strong union.

The union, however, will not be as strong as if the two metals were fused, but if all parts are properly heated and fluxed, the union will be strong enough for many jobs. Often a bronze welded union will stand in excess of 50,000 psi.

Either method of welding requires a good welding outfit. Welding cannot be handled

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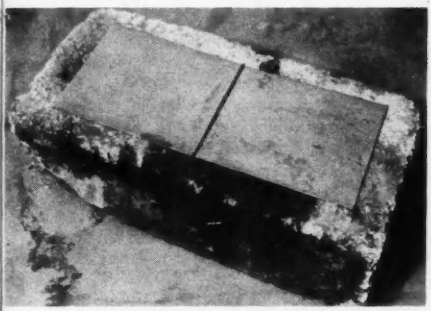
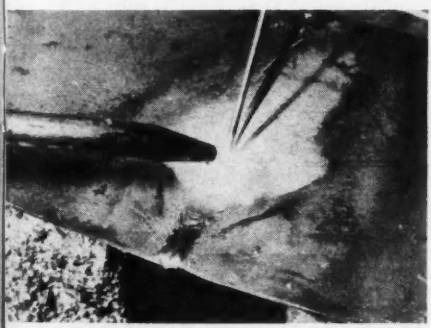
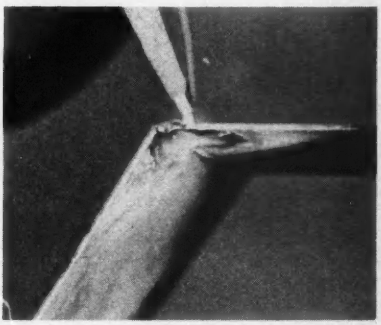


Only practice will make a good welder. Instead of working on that torn fender, start practicing on two pieces of scrap flat stock.

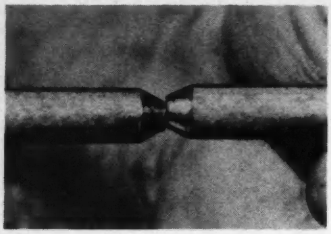
With the practice pieces on heat absorbing surface, tack-weld the two extreme ends of the seam. All jobs should first be tacked.



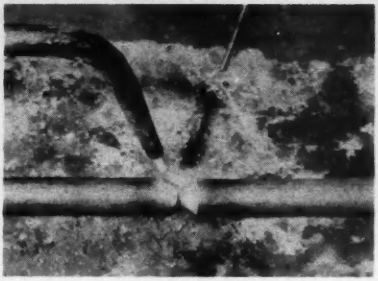
Now begin the seam. Place rod in puddle, never in flame outside of puddle, which will create "butter weld" which has no strength.



When you've mastered the flat butt-joint, try a corner weld. Notice that heat and fusion process penetrates through the seam.



When welding bar stock or pieces of rod together, chamfer each of the two mating ends as shown to allow heat penetration to core.



To weld, carefully heat and fuse bars at the bottom of the V cut, then build outward from the bottom until weld is even with surface.

with makeshift gear. The proper tools should be rented or purchased. You will need oxygen, acetylene, regulators, hoses, torch, tips, goggles and wrenches. The entire set will probably cost about $100.

The gases are stored in tanks. These will be the only expendable items in your shop and can either be purchased or rented. Generally, if you do but little welding it is best to purchase the small "amateur" cylinder kits. The reason for such a purchase is that commercial suppliers are interested in fast turnovers. They rent tanks for $7 for a 30-day period. If the tanks do not comeback for a refill at that time they charge 4 cents per day till they are returned. Small tanks can be purchased for $40 a pair with no additional charge except $5 for the refilling of both tanks whenever required.

A home welder will not normally use a small tank in 30 days. The small tanks supply about 40 hours of welding with a normal tip, and this should last about two to three months.

Regulators

Cylinders are sold with valves, but without regulators. You will have to purchase your own, and they are *necessary*. The pressure in the torch is but a small portion of the pressure in the cylinders. Some means must be used to regulate the pressure. That is the valve and gauge combination. As the gas is drawn from the cylinders the pressure varies, yet the pressure at the tip must remain constant. That is the function of the valve and gauge combination.

There are two gauges on the regulator device. One connects directly over the valve on the cylinder. It tells how much pressure remains in the cylinder and in this manner tells how much gas remains. The second gauge operates in conjunction with a valve which regulated the pressure coming out of the cylinder. It tells how much pressure is reaching the torch.

The two regulator valve-gauge combinations are not the same. They have gauges with differing pressures since the pressures within the cylinders differ. The oxygen cylinder, for example, has over 2000 psi pressure while the acetylene cylinder has around 400 psi. It is important to get the proper regulator on the proper cylinder, but this job is simplified through the use of right-hand threads so that is is impossible to attach the wrong cylinder to the wrong valve regulator.

Before you attach the regulators open the valve at the cylinders for one second. This will let the gas escape briefly. The gas will carry with it any dirt which may have lodged in the valve opening. When the valve openings are clean attach the regulators.

After the regulators are installed connect the hoses.. You will notice that the hoses are colored. One will be red, the other green. This is a universal welder's sign language. Red is always connected to the acetylene and the green to the oxygen. Once again there will be left and right-hand threads and it will be impossible to make a wrong connection.

Then, connect the hoses to the torch. Again the connections are designed to eliminate any chance for error. Connect the red hose to the acetylene valve and the green hose to

Here is an example of a good weld seam. Note that metal is well fused and that metal is deposited in small, concentric semicircles.

Rear view of a properly welded corner seam shows good heat penetration, causing almost a duplicate of the bead shown in left photo.

the oxygen valve. Then close the valves on the torch.

Place soap suds around all connections. Open the valve on the cylinder, but be certain the valve on the regulator is off. You will notice that the gauge above the regulator valve is of a lower pressure than the metering valve over the cylinder. If you were to open this valve the full pressure of the cylinder would shoot into the gauge and break it. After the valve on the cylinder is open check the suds for a possible leak. If there is a leak close the valve, remove the regulator and tighten the cylinder connection. If this does not stop the leak call your supplier and have the cylinder replaced. Do not use a leaky cylinder. Do not open the acetylene cylinder more than ½ turn. Should a fire begin along the welding line it is best to have the valve as near the off position as possible.

When the cylinder valve is o.k. open the regulator valve till it reads the proper pressure. For acetylene it should be between 5 and 8 pounds pressure, and never over 15 pounds. Oxygen should be opened from 3 to 10 pounds pressure, check all the lines. If they are o.k. you are ready to weld.

Welding

Pick up the torch and crack the acetylene valve slightly. Do not open it more than ⅛th turn. You need only a small trickle of gas to ignite. Using a welding spark or friction lighter, cast a spark in front of the nozzle. The gas will ignite.

Then open the valve till the flame is strong enough to shoot about ⅛ inch out of the

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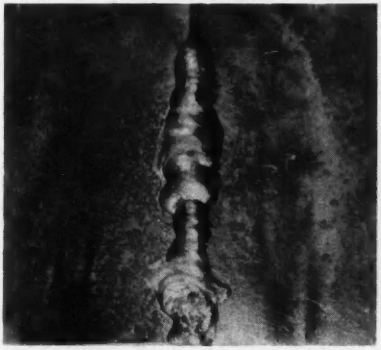
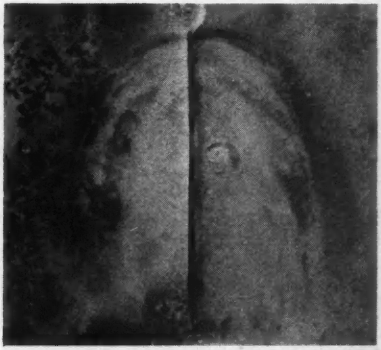


An excellent example of a "butter weld" is shown here. Rod was apparently held out of puddle, in flame, making drops, not fusion.



Reverse side of "butter weld" shows lack of penetration of heat or fusion. Weld has merely been built up on top of butt joint.

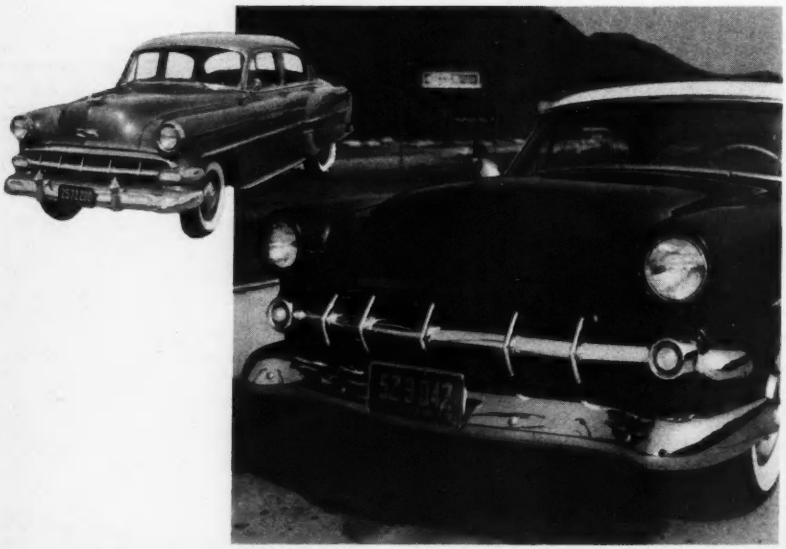
"GRAB BAG"

CUSTOMIZING WITH '54 COMPONENTS

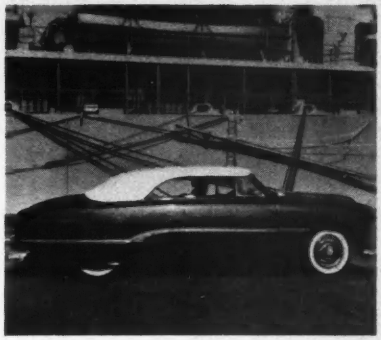
Photos by Medley, D'Olivo, Barris

By Dick Day

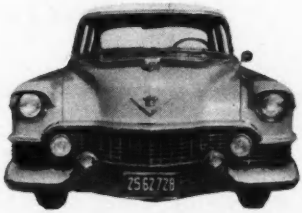
BY FAR the most popular method of customizing lies in the clever switching of trim and other components from one make of car to another. When the year end rolls around, the customizer is right on the spot to check out the latest thing in Detroit chrome stripping, headlights, taillights, bumpers and grille assemblies. The variety of these goodies and the uses to which they may be put is endless. This month's GRAB BAG deals with the 1954 trim and the uses to which it has been put over the past year. However, at the beginning of each year, as the new models make their appearance, we will feature the latest in trim, just to keep you abreast of the times. Here's what *has* been used; watch for the '55 trim that *can* be used on future customs.



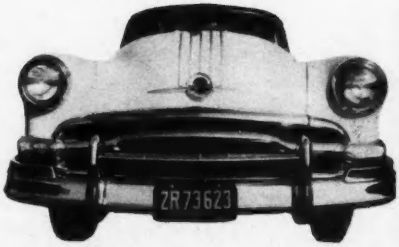
Jerry Carrillo made use of Chevrolet grille components to restyle his '53 Ford Victoria. The straight center bar was made by mounting two of the stock bars together. The teeth are used in their stock form. The outside parking lights are from '54 Ford.



With the emphasis being put on restyled side trim these days, Don Carroll has come up with a very simple yet effective trim for his '49 Ford. He removed stock trim and mounted side trim from a '54 Dodge at a position accentuating the lowness.



Johnny Luna didn't hesitate picking up on the Cadillac headlight fad which is becoming very popular. The stock Cad headlight rims are a natural for the Olds fender. They fit perfectly and require little body work to install. Note the Pontiac grille.



The most popular of all the '54 components seems to be the Pontiac grille's center bar. We have seen it in just about every make so far. Dave Long's '52 Chevrolet is a very effective example. Dave used only the bar itself, removing checkered center section.

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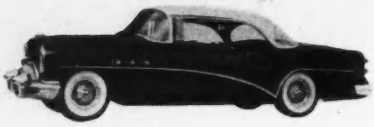
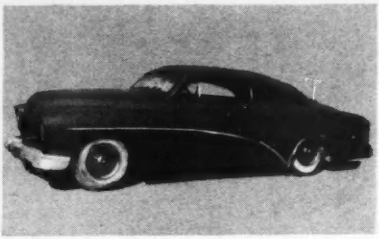
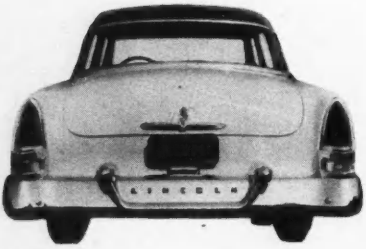
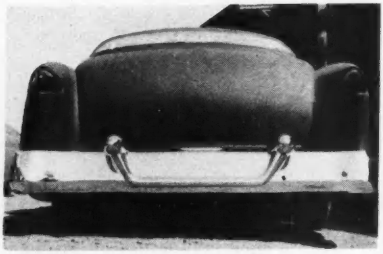


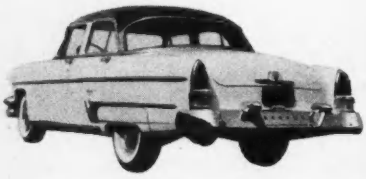


An item that has not been too prominent, but one that we feel will be so in the future, is the '54 Buick Riviera side trim. It was made for radiused wheel openings which are becoming very popular and harmonizes exceptionally well with rear fender airscoops.



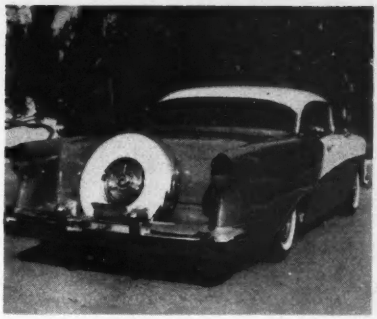


'54 Lincoln bumpers and bumper guards are fast becoming a tool for the customizers with their massive yet simple design. The bumper guards are being used for exhaust tip restyling similar to the past use of '53 Kaiser guards with the exhaust tips protruding from spinners.

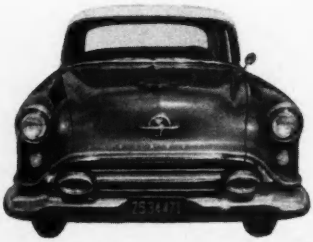


The Lincoln Capri taillight lens is still a popular item among the custom car clan. It can be used in many ways. Installed in a late Merc, it will resemble a baby Capri. Frenched into rear fenders of other makes it gives that original and expensive touch.

The new Packard taillight has fast become popular because of the need for a proportionate lens, aside from the Capri, for the large-bodied cars. When a continental kit is installed, it serves as the needed extension for the rear fenders. It blends with cars featuring kick-back bumper tip exhaust systems in line with the fenders.



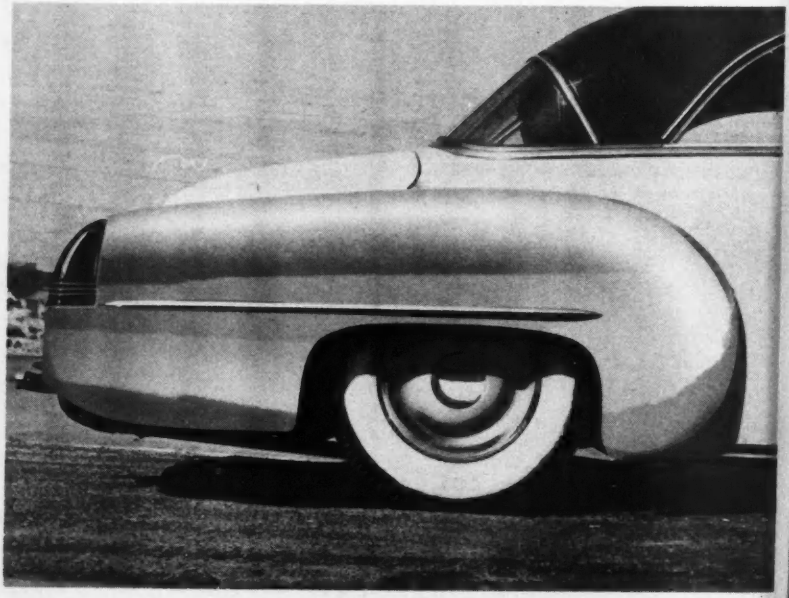
If you wish a different appearance in headlights than just your stock rims being frenched-in, then the Buick headlight rim may well be the answer. They can be installed in a stock manner or extended and frenched-in as in the photograph at right.



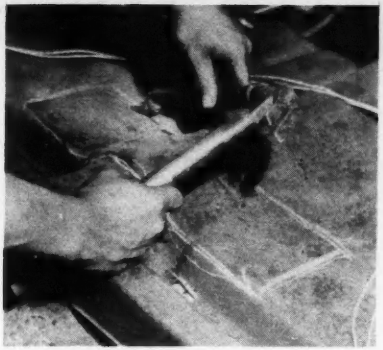
The Oldsmobile center bar is one of the most functional of all the '54 components. It can be restyled for the Olds itself as in photo at right, with frosted lens for the directional lights, or can be shortened and used as a center bar for other makes in the same motif.

Lowering a Chevrolet

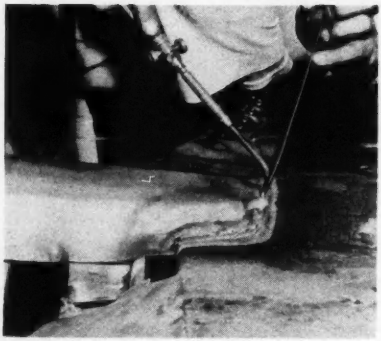
Part II, Conclusion



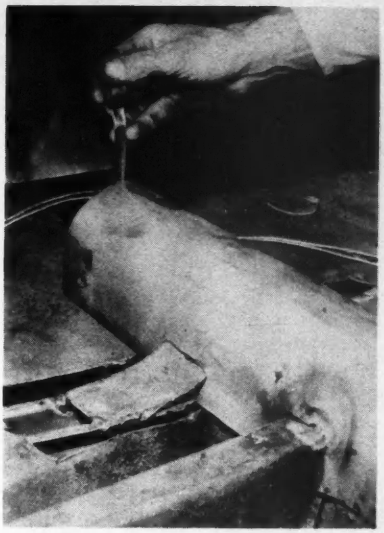
Text and Photos by Bob Lee



1. After the exhaust has been raised to its proper height, the forward floor section was changed. Because rear axle was raised the drive shaft was raised by same percentage at the rear. However, the forward end of the propellor shaft was not moved, since it is secured by a U-joint to transmission shaft. Thus, the increase in drive shaft height is on a taper: more at rear and less at front. Just behind rear-seat rim is a "hat" section or stiffener which arches over stock tunnel. This, as well as entire tunnel, must be raised to provide clearance. It is not necessary to tear up entire floor. Only floor section in area of stiffeners was disturbed.



2. As seen in this picture, the hat section which curved into tunnel was removed and new stiffener was built with new clearance. New tunnel, also built on taper, was welded on top of old tunnel. After new tunnel is completed old tunnel can be cut out from bottom of car.



3. This shows the height of the new tunnel section at the front. Floor stiffener located here was also removed and new one welded in position.

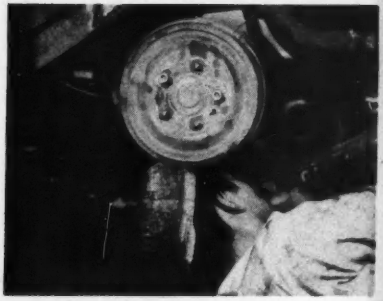
4. The tunnel was then completed and looked like this. Floor board area which was cut out to provide access to stiffeners was also covered and undersealed to make neat appearing job. It will be noticed that the tunnel is higher than stock seat ledge. This will require a corresponding adjustment in rear seat contour. What happens is this: a circle is cut out of center of rear seat to fit over tunnel. Short springs are used to replace stock springs which rest on tunnel. Otherwise seats stay stock.

CONTINUED

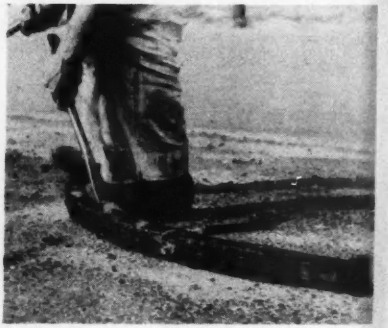
5. The new floor section for the trunk is shown being fitted in position. The edges of the step-ups are used for supports on the floor section. Trunk floor section will be welded to floor and wheel wells, then undersealed.

6. Underneath the floor section, the trunk compartment looked like this. The trunk floor section was stiffened with a metal strip run between step-ups. The metal strip will serve two purposes: it will strengthen floor section and will provide strip to which shock absorbers can be attached.

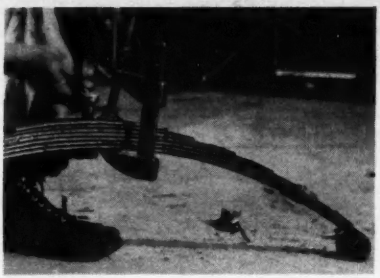
7. After the stock floor tunnel was cut away the new tunnel looked like this. Upright at top right of picture is forward section of the new trunk floor. Shaft, at lower right, is then jacked into position to check clearance of the new tunnel. Shaft must not touch even when axles bottom against snubbers.



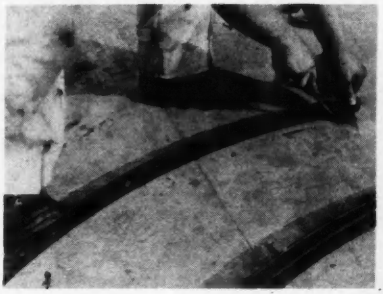
8. To accomplish the required drop, the rear springs will be de-arched to raise the axle into the step-up and place the car lower to the ground. Shown here, is removal of the "U" bolts. Spring is held by "U" bolts, rear shackle and stationary front bolt. Procedure is to remove "U" bolts, dismantle shackle unit, drop springs and remove stationary bolt.



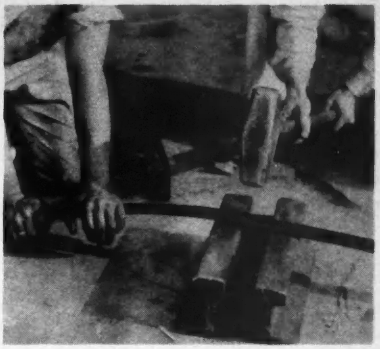
9. Chevrolet springs are covered with protective sheet metal and canvas to retain lubrication. These must be removed before springs can be de-arched. After outer covering is removed clean springs with gasoline to remove all grease.



10. Next, remove the center bolt which holds the leaves in position. Before starting, clamp the leaves together to prevent them from springing apart. Unscrew center bolt and remove clips on outer edges.



11. Dismantle the leaves and complete cleaning process. Springs are now ready for de-arching. Dietrich wanted only "mild" de-arching of three inches. He planned to pick up additional drop with blocks. Mark the stock arch for reference so you know when you've de-arched specified distance. On Chevy it is often unwise to de-arch more than three inches because shackles must be moved to compensate for added length. Valley Custom feels that the added length of flattened spring relocates center bolt which is designed to fit into axle slot and locate axles. It is much better, if de-arching is to be greater, to shorten springs too, they feel.



12. Only three springs, main, 2nd, and 3rd leaves are de-arched. Main leaf is de-arched three inches; 2nd leaf is de-arched two inches and 3rd leaf is de-arched 1 inch. Springs are then assembled.

13. Springs were reinstalled and lowering blocks used to raise axles. Step-up does not lower car. It only provides room into which the axle can be raised. Dietrich will level car off at a 5¼ inch drop.

STARTING NEXT MONTH

How to Build a Sportsman Class Modified Stock Car

Small-bore bombs can give you

STRAP AN

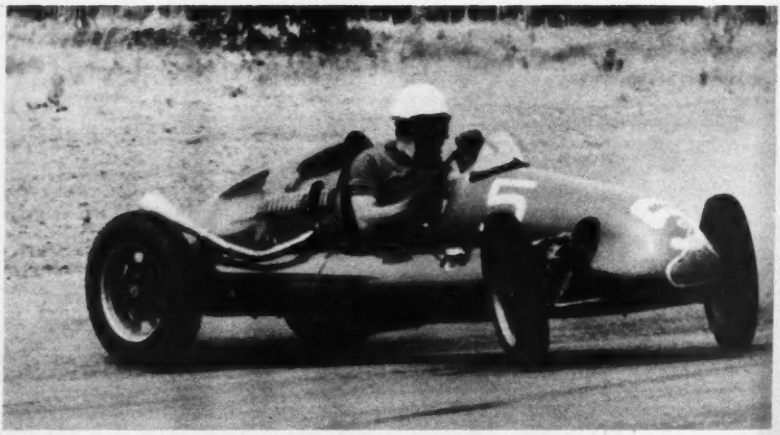
By John Christy

A GUY with small money in his pants pocket and a yen to race has the same problem whether he lives in Los Angeles, West Fencepost, U.S.A., Little Tottering-on-the-Brink, England, or Waltzing Matilda, Australia.

During World War II, several young fellows working for the Bristol Aeroplane Company, Bristol, England, got to bench racing. They were what they called "impecunious enthusiasts" or, in other words, the guys referred to in the above paragraph. Before the war, in England, at least, you either owned an automobile company, had a spare million or so, or you just plain didn't race. Over here we had midgets but by the time the war broke out, the midget wasn't exactly for the "impecunious enthusiast" either.

What the Bristol gang dreamed up was a small race car to be powered by a motorcycle engine. Since English bike engines are not cheap, they settled on the 30.50 inch or 500 c.c. racing engine as being within reach and yet not too small to get out and scream. The idea of the bike engined race car was not exactly new or untried. A man by the name of Joe Fry had built a cycle powered drag machine before the war and had walked off with sundry trophies and another builder by the name of Davenport had practically owned hill climb racing for several years with such a set of wheels.

When the war ended, several of these enthusiasts started to work. One of the first of these to finish a car was a lanky gent named Colin Strang, head of an automotive engineering business (speed shop to us) in Harrow. Strang's car was to prove the basis from which all the later "500's" were built. While others were trying to make their small-bore bombs *look* like race cars, Strang concentrated on making his car *go* like one, with



Cooper "500" is by far the most popular of the "ready-made" Formula III cars in the U.S. Here's Warren Mylenbeck's D.O. Norton Manx powered job, all crossed up at Torrey Pines.

a belt in the seat that you'll never forget when you

ENGINE ON YOUR BACK

Home-built machines are appearing in ever increasing numbers. Fred Glass's converted midget is powered by a reworked Speedway J.A.P. engine. Car is one of the cleanest.

the result that he blew off all comers in the first meet in which he ran. Strang's car was based on FIAT "Mouse" chassis components with cross-sprung independent front end and trailing quarter elliptic rear springs, all from the "Mouse." An HRD Vincent 30.50 single cylinder bike engine and transmission supplied all the horses Strang needed to push himself and his car faster than anyone else.

When others saw what could be done with a bike engine, a couple of chassis members and the right kind of suspension, all judiciously distributed in the right places, they began like good hot rodders to improve on the original.

One of the first improvements was thought up by John Cooper (CAR CRAFT—Oct. '54, The Littlest Champion), his father Charles and Eric Brandon. Their idea was to take not one but two "Mouse" chassis, cut them in half and put the two front ends together to make a four wheel independent suspension. This chassis was powered with the J.A.P. racing bike engine which was later to become almost standard equipment for "500" cars. The first few times out Cooper didn't do too much, being busy ironing out the inevitable bugs. Finally at a drag race in the resort town of Brighton, Cooper took everything in his class. Next time out, at another drag meet, he took everything in all classes, regardless of size.

So much for history—the rest is pretty much an old story; Cooper went into business building cars for others as did Cyril Kieft and several others in England and Effyh in Sweden.

All the historical background doesn't point up the fact that these small-bore bombs, which are actually nothing but miniature lakesters with roadability, are FUN. We'd

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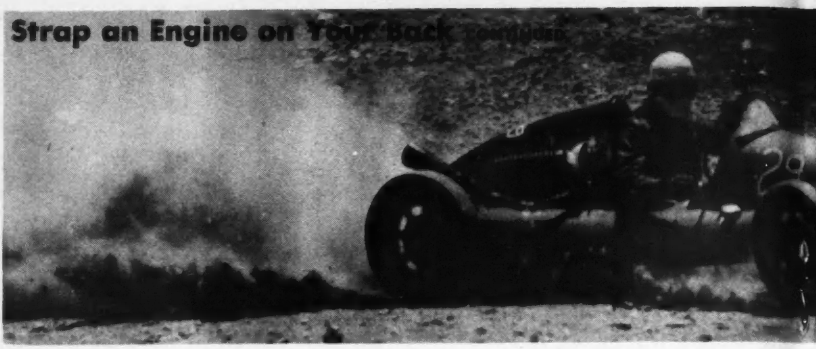
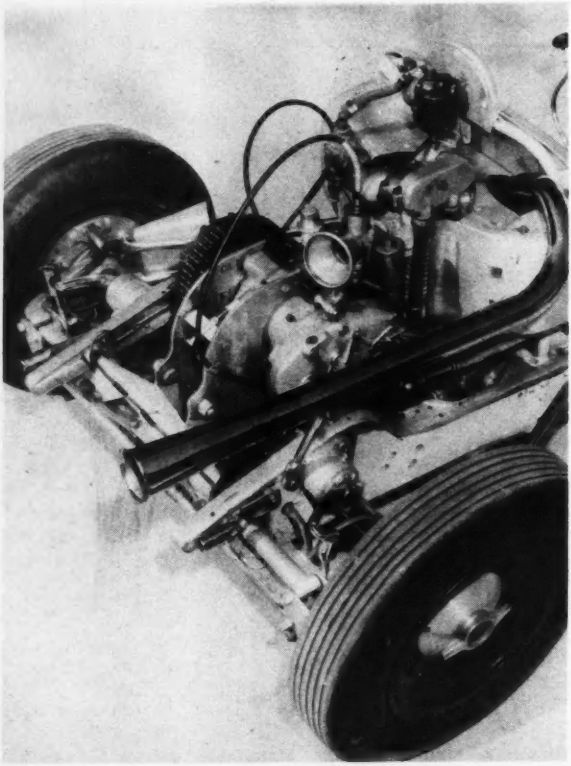
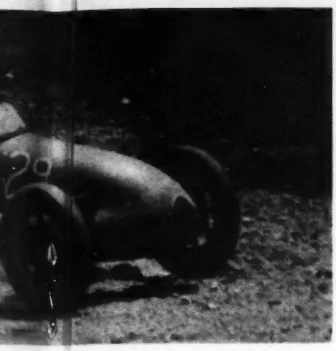


Dr. Leon Becker, barreling brain surgeon, runs out of road at Willow Springs in Cooper.



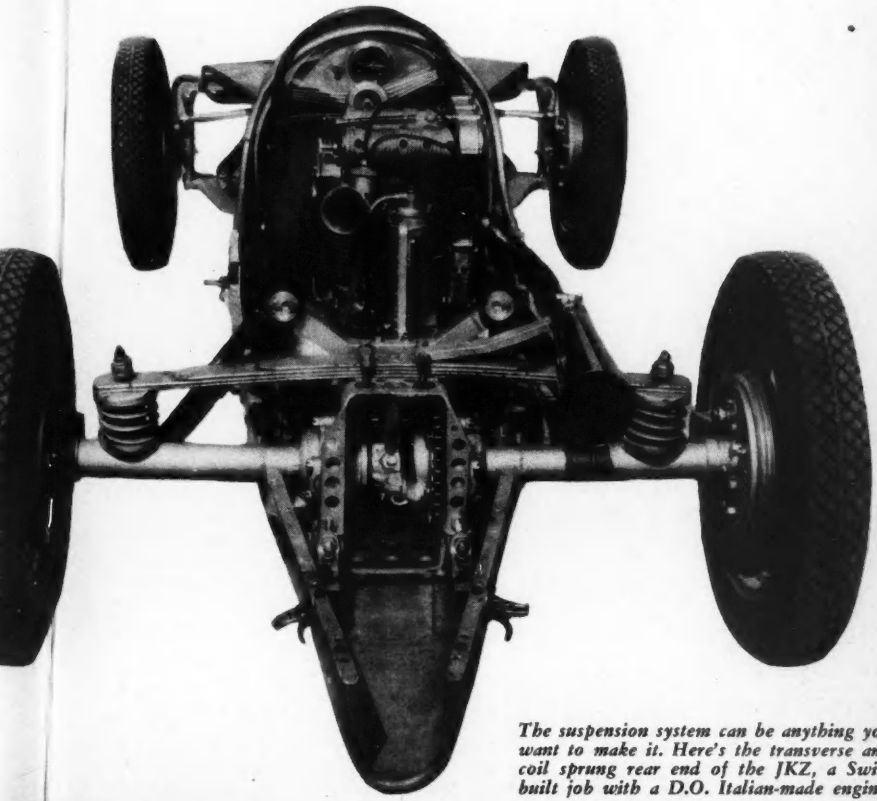
The engine in Glass's midget is rear mounted, standard operating procedure in close-coupled Formula III cars. Note midget frame.



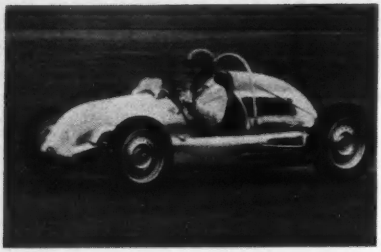
seen an occasional one or two at race meets and drag events but never paid too much attention to them until we got a chance to get into one. Having taken an occasional spin around a track in a Sixty midget in years past, we were prepared to be unimpressed—after all, what could 30.50 cubic inches do that 134 healthy cubes couldn't?

The test strip was an acre of asphalt behind the CAR CRAFT office, used as storage space by a local Chevy dealer. The car was a middle-aged Mark IV Cooper with one of the largest Norton bike engines we'd ever seen, belonging to John Fox to whom we have referred in the October issue. This was

(*Continued on next page*)

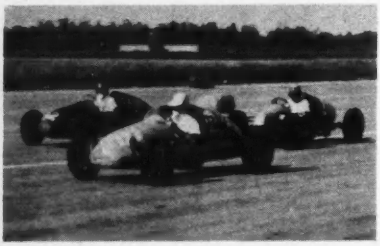


The suspension system can be anything you want to make it. Here's the transverse and coil sprung rear end of the JKZ, a Swiss built job with a D.O. Italian-made engine.



The Swedish Effyh is the most expensive and elaborate of the "tailor-made" 500 cc cars.

Pit-work is simple with a Formula III race car; they can be field-stripped in minutes.



Two Coopers and Bob Wenz's home-built Ariel-powered job in rubber-burning start.

Doc Becker and Warren Mylenbeck storm Willow Springs hill ahead of Buick-Deuce.

Strap an Engine on Your Back

CONTINUED

the car that Foxy had barreled 97 mph through Bud Coons' NHRA traps at the Willow Springs race (CAR CRAFT—Sept. '54).

Foxy turned on the fuel (alcohol and several other ingredients, the combination of which turned the asphalt light brown when a little spilled), coasted down the driveway and popped the clutch. The car bucked a couple of times, coughed and then suddenly took off, leaving a 20-foot streak of burnt rubber. After a couple of warm-up laps around the lot, Foxy stopped and we slid in. The gear shift is a motorcycle progressive system in which you tap the clutch with a toe and at the same time yank back on the shift grip. This gets you into low, the result of which is like getting swatted on the back by a moderately large gorilla. For second, third and fourth you tap the clutch and slap the handle forward, once for each shift. There wasn't room to get into high cog but we swatted the handle forward twice and got belted in the region of the hip pockets each time we hit it. Backing off for the first turn and then hitting the throttle in the turn we expected the thing to slide like a midget. It did no such thing.

All that actually happened was that the engine let out a beller and we went around the corner feeling a little like a rock on the end of a string. The tachometer was reading 5000 (it's good for over 7000) when we started to run out of asphalt. This time we hit the brakes, dropped down a cog and turned the wheels. In any ordinary car this kind of thing is guaranteed to set one on one's head before the thought occurs that maybe something is wrong. All the Cooper did was go around the corner, lay about 10 feet of rubber and streak for the other end of the lot. Feeling as though one or more natural laws had been repealed, we made about three more such laps at the end of which we were ready to be convinced that Foxy consistently turns in the high 90's

at drag meets as well as being able to get past assorted Chryslers, Mercs, Jaguars and Ferraris at road races. That ride was also an answer to the question of why several "500's," or Formula III cars as they're now called, could get around a half-mile dirt track in Offy midget times. Compared to one of these cars, the standard midget has all the roadability of a greased brick.

The best thing about Formula III racing is that the cars can be purchased complete with engine or complete without engine or piecemeal or you can build from scratch as did the pioneers of the sport. All you need for building one from scratch is a defunct FIAT "Mouse" and a good 500 cc bike engine.

The last range in price and performance to fit any need with the Norton "Manx" and the J.A.P. being the most popular. However, Ariel, Triumph, BSA and AJS also have been used with success. Any part or set of parts is available from the U.S. Cooper distributor, Cooper Racing Cars Ltd., San Anselmo, California.

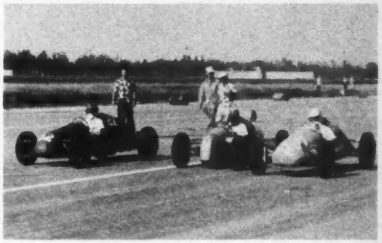
Present American 500 Club rules allow the use of double overhead cam engines up to 30.50 cubic inches or flat-heads up to 45 cubic inches. Two-stroke engines up to 30.50 inches may also be used if crankcase pressure does not exceed 1.24 atmospheres or approximately 18.5 pounds per square inch, the idea being to prevent the supercharging effect created by high crankcase pressure in such engines. Complete rules on engine and chassis dimensions may be gotten by writing direct to the 500 Club of America, 2708 Magnolia Blvd., Burbank, California.

Not only are these little bombs used in road racing (never call 'em sports cars unless you want a belt in the eye) but drag racing and hillclimbs as well. In fact, any form of automotive sport in which speed and handling count is meat for the "500."

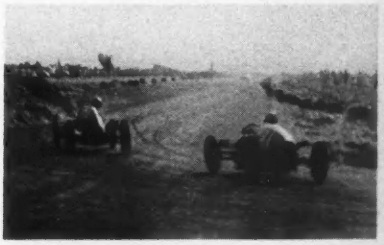
Next month we'll give you a breakdown on two cars. One is Fred Glass and Howard Falls' home-built J.A.P.-powered job and the other is Foxy John's Mk. IV Cooper, the one that convinced us that small-bore bombs are nothing but FUN! Don't miss it. Later, we'll give you a breakdown on several engines you can use.

Two Jag owners learn what speed is when they're passed by Mylenbeck, Foxy, Becker.

One rear-engined job, a Porsche with 91 inches, about to be passed by 30.5 inches.



If this looks like a three-car drag, that's what it is. Becker, Wenz, Mylenbeck, L to R.



Becker and Wenz go into 90 degree bend in a dash for the finish line, sticking tight.

TORCH TIPS

INSTALLING '54 PACKARD TAILLIGHTS IN LATE OLDS

EVER since the June issue of CAR CRAFT Magazine hit the newsstands, featuring Bill Gaylord's '51 Olds custom, we have had a large amount of correspondence concerning his popularly accepted rear fender restyling, utilizing the '54 Packard taillights.

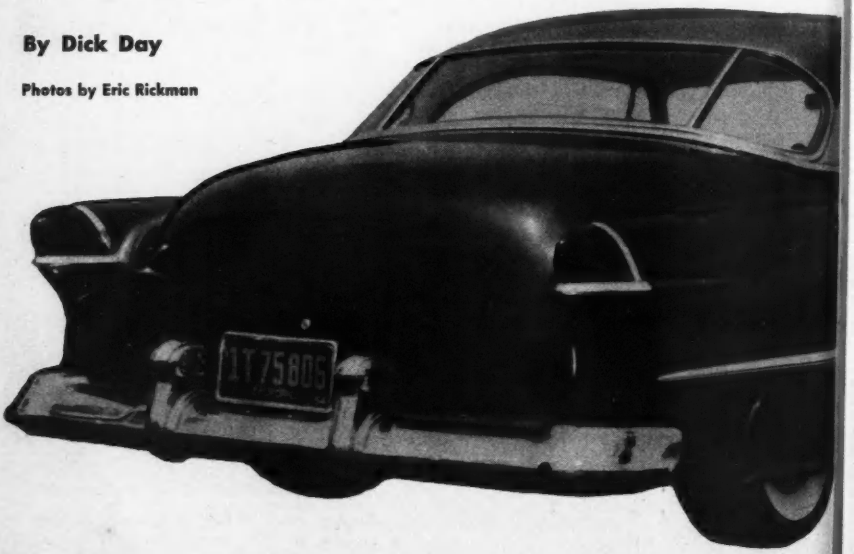
For us to reproduce this story in a how-to-do-it form necessitated our focusing the evil eye on several shops around town for a similar job to be done. The story finally broke at George Cerny's Body Shop in Compton, Calif. We grabbed our photographer, a ball-point pen, and for two days lived in George's back pocket, recording every step of the way.

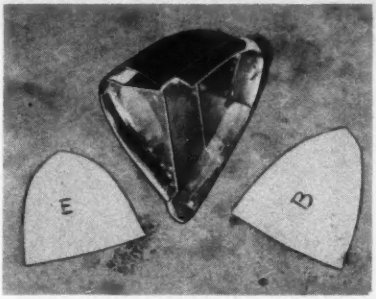
Let's have a review of why the Packard taillight is becoming such a popular item (at this writing there are about seven cars undergoing the same treatment). The light is so designed that it blends well with larger-bodied cars. It's a natural for needed extension when installing a continental kit. It enhances the fender line on cars that feature kick-back bumper tip exhaust systems in line with the lower section of the fenders, whether stock or restyled. These are but a few reasons for their demand.

To get back to the actual job of performing this treatment on your personal jewel, you will need the necessary basic body tools. If these tools are not to be found in your garage, then the local body shop can perform the task for about $35.00 a light by following a copy of this magazine.

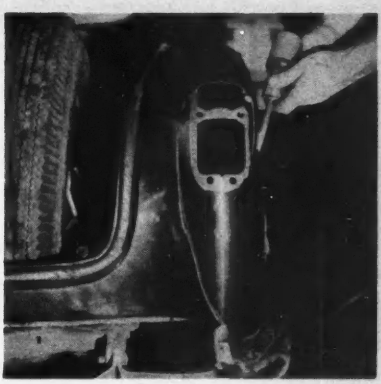
By Dick Day

Photos by Eric Rickman

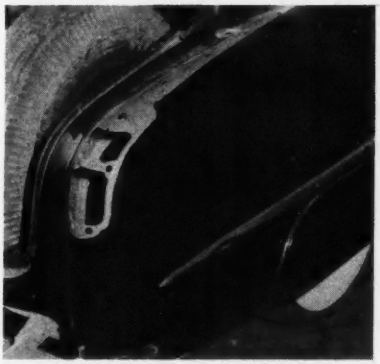




1. *First step is to cut cardboard templates of the taillight's bottom and end sections.*

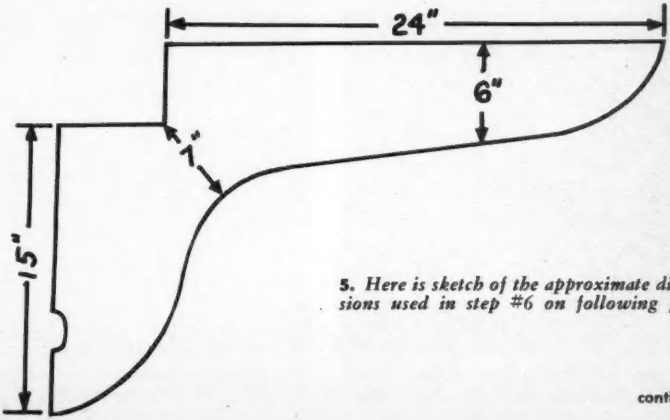


2. *Remove taillight and the chrome trim. Side trim may be wedged out for clearance.*



3. *Cut away the rear area of fender to approximate width of the Packard taillight.*

4. *Using templates, cut in step #1, check width of opening for base of taillight.*



5. *Here is sketch of the approximate dimensions used in step #6 on following page.*

continued

6. For time saver, Cerny used an old '52 or '53 fender from wrecking yard for splicing.

7. The inner flange of the old fender must also be trimmed off as pictured above.

10. Using a straight edge, align top of fender with the existing fender line.

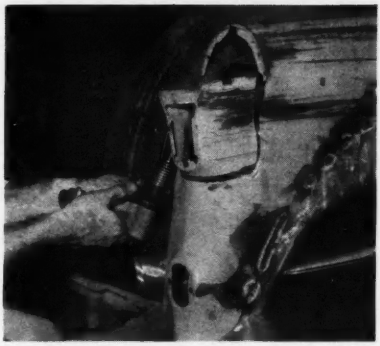
11. Tack weld the fender into position, frequently checking for correct alignment.

14. After the taillight's backing plates have been welded, check for proper angle.

15. Align the backing plate with the top of the fender and spot weld into position.

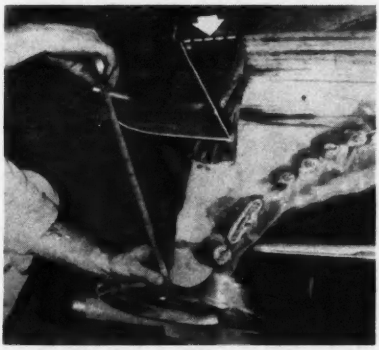
8. *The old fender is fitted to the approximate location and then deeply scribed off.*

9. *With electric grinder, grind off paint about 3 inches beyond the working area.*

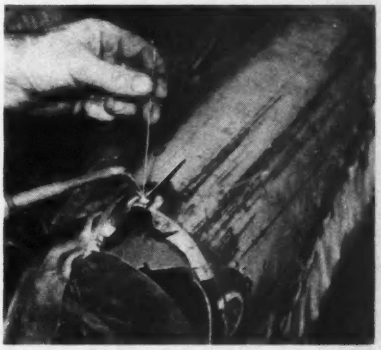


12. *Cut away the stop light section of the fender, checking the width as in step #4.*

13. *Scribe taillight templates off on sheet metal and weld straight edges together.*

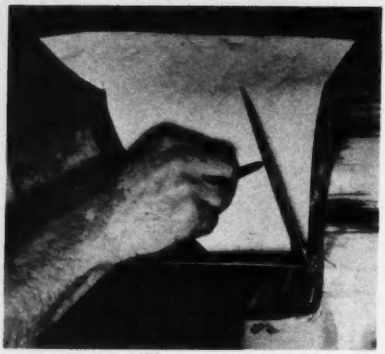


16. *At this point take two measurements as shown. Frequently check as work progresses.*



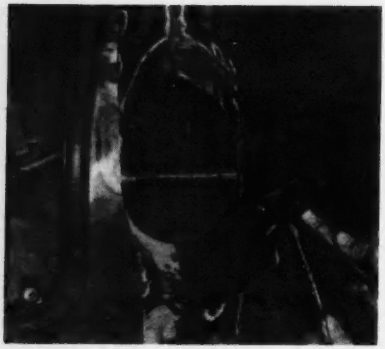
17. *Top of fender will have to be split and reshaped to conform with taillight.*

continued



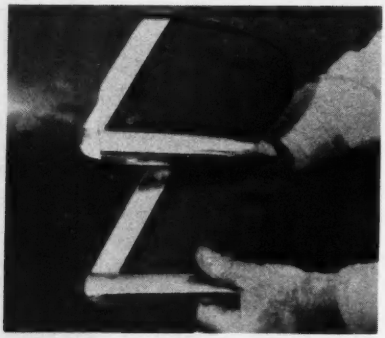
18. *Use cardboard again to make templates for filling in sides of the taillights.*

19. *When filling in between fender and plate, keep checking measurements of step #16.*



22. *Torch may be used to heat and bend the sheet metal to the correct contours.*

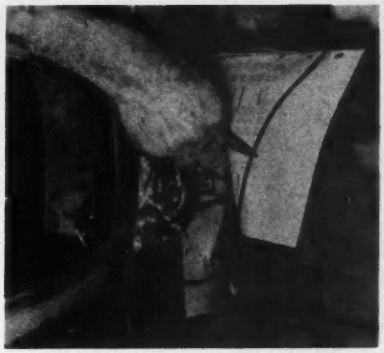
23. *Reversed curves will necessitate some hand work. Wrinkles can be covered later.*



26. *As you will note as shown above in the photograph, the inboard ends of the light frames (top) must be trimmed off.*

27. *Tin area for leading. Fix light in position and lead to its frame. Be extremely cautious of heat for frame is pot metal.*

20. *To obtain lower contour, bend heavy steel welding rod in place and tack weld.*

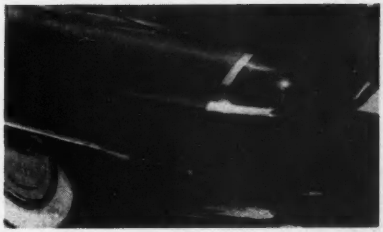


21. *Filling in lower section, again use cardboard for template making as in step #18.*

24. *After enclosing the whole area, thoroughly grind clean with an electric grinder.*

25. *Welds will also have to be gone over and thoroughly cleaned of excess flux.*

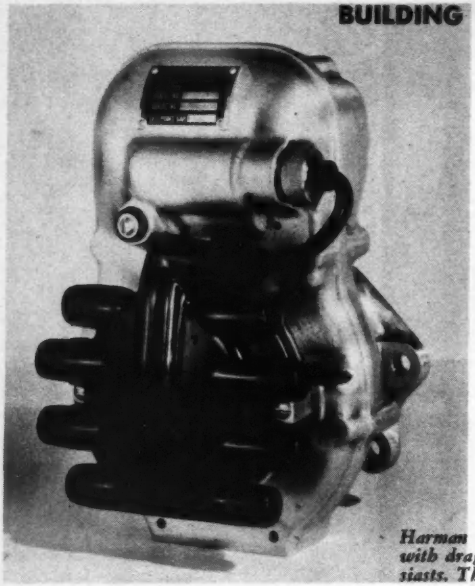
28. *Remove light and clean off lead that has oozed behind frame during leading. Contour and smooth leaded area with vixen file.*



29. *After area has been worked smooth with vixen file, sand (wet and dry) and prime.*

NEXT MONTH

CAD HEADLIGHT RIMS



SPARKING THE COMPETITION ENGINE

By Racer Brown

Harman & Collins magneto is a favorite with drag, straightaway, boat racing enthusiasts. This mag has a fixed spark advance.

Undoubtedly, the most critical phase of a new or freshly rebuilt competition engine comes immediately after the first "live" power stroke. "Is the carburetion right? How about ignition timing? Are the plugs too hot? Wonder if I put oil in it?" These questions and many more race through the mind of the anxious owner as he labors over his pride and joy. If the first two installments of this series (July and September '54, CAR CRAFT) have been digested and put to effective use we know that, mechanically, we have a Ford V8 or Mercury competition engine that will be hard to beat. Ditto if you have built an overhead valve engine, transposing the information as set forth for the Fords and Mercs. Now the fun begins.

Unfortunately, most people pay too little attention to the finer points of ignition tuning and timing, but, as usual, there is a right way to get the most out of any ignition system and, at the same time, improve engine power and performance.

Let's get started on spark plugs. When either gasoline or straight alcohol is used for fuel, the best choice of plugs to use in a modified Ford V8 or Mercury is the Champion H-9 commercial, or a plug that is equal in heat range and thread length. Not so with nitro. Because spark plugs can pre-ignite or detonate the fuel/air mixture charge in the cylinder if the plug is too hot, and because mixtures of nitro and alcohol are quite sensitive to temperature increases, we must use very cold spark plugs. Fords and Mercs usually require Champion K-3's, LA-10's or LA-11's. Of these, the K-3 plugs are the "hottest" and the LA-11's are the "coldest." Colder plugs may be had (the Champion LA series extends to LA-16's) but these are too cold for all practical purposes. Champion J-2's are about equal in heat transfer qualities to LA-10's, but the thread length is ⅜ of an inch, as compared to ½ inch for the LA series, consequently the J-2's should only be used in cylinder heads machined for a short reach plug. Contrary to a popular and misleading belief, the right plug is the "hottest" one that can be used without showing any signs of burning. But the right plug for one type of event may very well be the wrong plug for another. For example, K-3's would be a good choice for quarter or half mile drags or short distance track events, where plug oiling or fouling cannot be tol-

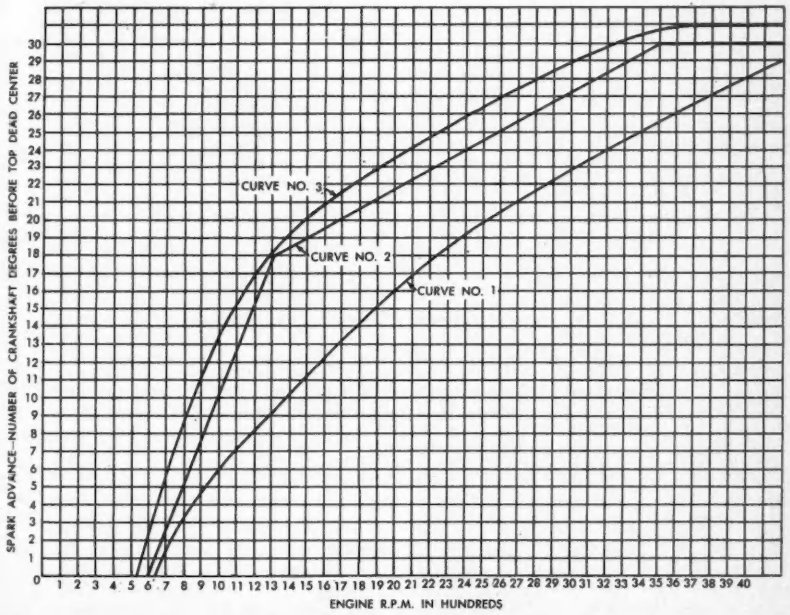
erated and there are periods of closed or part throttle operation. On the other hand, the same engine at Bonneville, loaded with about 40% nitro, would probably require LA-11's.

After about six or eight runs down the drag strip, or an equivalent distance, a new set of plugs should start to "color," provided the fuel/air mixture and spark plug heat range are correct. This may be observed by examining the plug's porcelain insulator for a tan or brownish tinge. If the plug is too hot or the fuel/air mixture is too lean, or both, the porcelain will be pure white before it turns dark and glossy, which indicates plug burning. If the plug "colors" too soon, they are either too cold, or the fuel/air mixture is slightly rich, or both. When checking plugs, the engine must be shut off "clean" under full power and load and not be allowed to turn under compression or idle, lest the visible evidence of spark plug condition be removed.

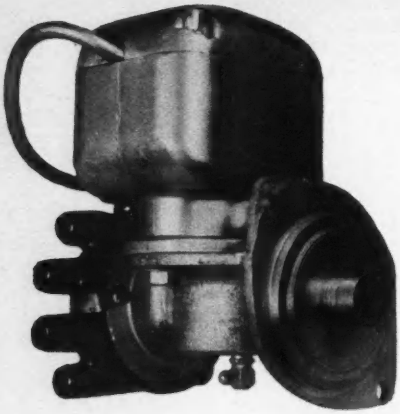
The spark plug electrode gap is largely a matter of the type of ignition used. For example, most magneto manufacturers recommend a gap of between .015 and .025 of an inch, while with competition type battery ignitions, a gap of .025 of an inch is the most common. Modified street engines operate quite well with a .030 of an inch gap. Again, contrary to popular beliefs, the wider the plug gap, consistent with best performance, the better. (For the full spark plug story, see March '54, CAR CRAFT—"The Forgotten Plug.")

Which brings us to ignition timing. I could retire if I had a nickel for every Ford V8 or Merc that has blown up from excessive spark advance. This particular malpractice, believe it or otherwise, has been responsible for 95 percent of the connecting rod, crankshaft and main bearing cap breakage experienced in competition Ford V8 and Mercury engines. Let's look at it this way: For the optimum power of an engine, under full throttle, full load conditions and at any reasonable rpm, the pressure build-up in the cylinder, due to combustion, must reach its maximum value close

(*Continued on next page*)



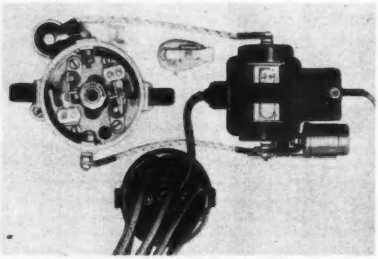
Curve 1 shows advance characteristics for a stock engine and stock ignition. Curve 3 is a plotted curve for modified engines and ignitions while curve 2 is actual modification.



Pounden magneto for Ford and Mercury engines has fixed advance, is used on tracks.

to 15 crankshaft degrees *after* top dead center of the compression stroke. Naturally, the combustion process takes time to reach its peak and, as far as engines are concerned, this time is expressed in the number of degrees of rotation of the crankshaft. We know that the time, or the number of degrees of crankshaft rotation, required for the pressure build-up to reach its maximum is more or less relevant to the degree of turbulence, or agitation of the fuel/air mixture, within the cylinder. In modern 'L' head engines, the degree of turbulence is necessarily high to compensate to some extent for a rather awkward combustion chamber shape, and to make sure that the fuel/air mixture in the nooks and crannies of the combustion chamber is agitated enough to burn properly, rather than become stagnant, which invites detonation and a resulting power loss. With a Ford V8 or Merc using either straight alcohol or nitro mixtures, it takes about 32 to 35 degrees of crankshaft rotation for the combustion pressure to reach its highest point, after the spark passes between the plug electrodes. From this, it becomes obvious that the most advantageous time for the spark to occur would be 20 crankshaft degrees before top center. This is one iron-clad point that requires no further experimentation to prove and is equally true for any Ford V8 or Mercury flathead, regardless of piston displacement. For use with gasoline in a similar engine, the spark should be timed to fire between 16 and 18 crankshaft degrees before top center, the difference being due to the faster burning rate of gasoline.

If, however, the spark is timed to fire at, say, 30 crankshaft degrees before top center, the pressure build-up would reach its maximum at about five degrees after top center and then the leverage factors that exist between the crankpin and connecting rod cannot be used to full advantage to transfer the pressure in the cylinder into usable torque at the flywheel. As a consequence, the impact of the pressure rise within the cylinder, which takes about .0012 of a second to rotate 35 crankshaft degrees at 5000 rpm, must be absorbed by the piston, piston pin, connecting rod and crankpin, as usual, but at a time when the angularity of the rod cannot effectively transfer the combustion pressure into torque. Under these conditions, the power-transferring components are subjected to varied and undue stresses that eventually can only lead to fatigue failure of one or more parts.



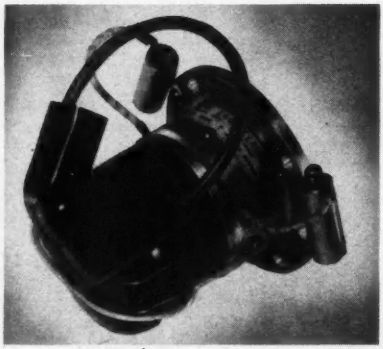
The Mallory Magspark battery ignition does away with coil, works best for street.

To go a step further, I know of a couple of otherwise competent engine builders who insist on timing their Mercury flathead engines to fire at about 42 to 45 degrees before top center. In these cases, if the inertia of the rotating engine parts didn't overcome the gas pressures, these engines would actually try to run backwards. Timed like this, the power output is only fair and the high mortality rate of blocks, cranks, pistons and rods is the only thing these guys can lay any claim to.

The same situation exists in overhead valve engines, but due to more compact combustion chambers and a lesser degree of required

turbulence for proper combustion, more spark advance is necessary so that the pressure build-up will also reach its maximum at approximately 15 degrees past top center. It's difficult to lay down specific figures for all engines, but the spark timing for best power for most modern overhead valve conversions will fall between 30 and 35 crankshaft degrees before top center, using alcohol and/or nitro blends. However, there are a few notable exceptions to this general rule, namely the Ardun overhead valve conversions for Ford V8's and Mercs, Wayne heads for Chevrolets and Warner heads for GMC's. The one point of similarity of these heads and others is the fact that spark plug location is of the "cartridge" type. Here, the plug is connected to the combustion chamber by a drilled passage, usually from 3/16 to 1/4 of an inch in diameter, which results in a delay between the time the plug fires and the time the fire starts in the main combustion chamber. This arrangement naturally requires even more spark advance than others, usually between 40 and 60 crankshaft degrees before top center, depending on the type.

Competition engines used on courses where

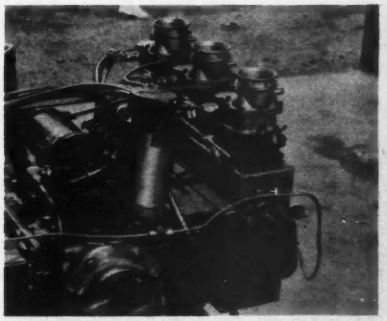


McGurk two-coil ignition has centrifugal advance, is a dual purpose distributor.

maximum power must be available from the lowest to the highest rpm, usually require a positive method of automatically advancing the spark. However, for drag strips, straight-away courses, fast tracks, boat racing, etc., a "fixed" spark is best. In other words, the distributor may be set to fire at the correct point and locked in position. In these events, the engine is seldom run below 2000 to 2500 rpm, which, in most cases, is above the point where a spark advance curve would be of any practical value. The best way to set the spark timing of an engine is, of course, on an engine dynamometer. A chassis dyno or road tests may also be used, but the finer points may sometimes be lost through the insensitivity of the chassis dyno or the many variables of a road test. If the degree of spark advance for optimum power is an unknown factor, a degreed crankshaft pulley or flywheel and a timing light are essential tools in solving the mystery. On the dyno, the engine must be run at full throttle, full load at an rpm that falls within the engine's average operating range; the spark advance adjusted to produce maximum power on a sustained run and the setting checked with the timing light and a stationary pointer. When the correct point has been found, a dot or stripe of white paint should be used as a timing mark for future reference. In this way, the distributor may be removed from the engine if necessary and reinstalled without recourse to guesswork.

The dyno, degreed pulley or flywheel and timing light are also necessary in plotting the spark advance curve required by the engine. In this case, the engine should be run on the dyno at full throttle, full load at the lowest speed that will be encountered on the race course and the spark set to produce the best power, checking the point with the timing light. This procedure must be repeated at 200 rpm increments until an engine speed of about 2500 rpm is reached.

(*Continued on page 61*)

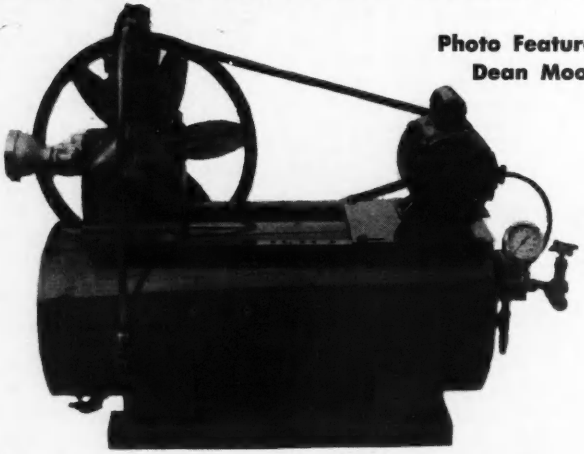


Scintilla Vertex has automatic advance and can be adapted for use on any type engine.

Garage Gimmicks

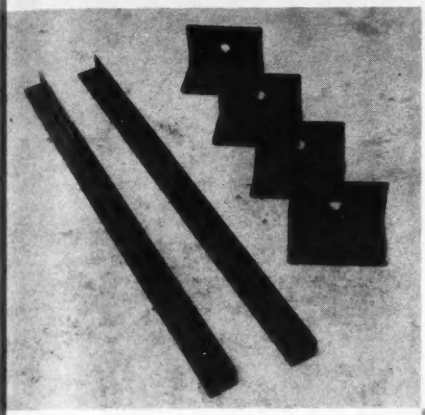
$300 Air Compressor for $30!

Photo Feature by Dean Moon



NO MATTER what the job or circumstance may be, it always pays to "Do it Yourself." For instance, say you scraped a fender skirt on a high curbing, and only the paint was damaged. Repair costs for this sort of 15 minute job usually run about $5. With a gem of a little air compressor under the bench in your home workshop the same job could be conquered for about $1! Use of a small displacement type of compressor doesn't stop here by any means, however. Everything from blowing parts clean to filling your own low tires, and many more uses too numerous to mention, will be discovered the instant you put your own "Do it Yourself" air compressor into operation.

Three main components of any compressor are the tank, compressor unit and the power source. For the tank, a 20 gallon water heater core will do the job very nicely. These are junkyard items for about the standard figure of $2. For a compressor, a unit from an old Kelvinator ice cream freezer was used in this case. Other refrigerator units may be used but be sure to scrounge one that has two cylinders. When procuring this item try to get the motor at the same time, along with the drive pulleys and belt. Costs will be reduced greatly if such a find and purchase can be made. If at the time of buying the compressor unit you cannot get a motor, any ½ horsepower electric motor will suffice. If a ¼ hp is the only one obtainable, it may be used with a smaller drive pulley. The only difference in operation of the finished product will be that it will take longer for the ¼ hp motor to get up to the desired pressure in the tank. Total cost should not exceed $30!



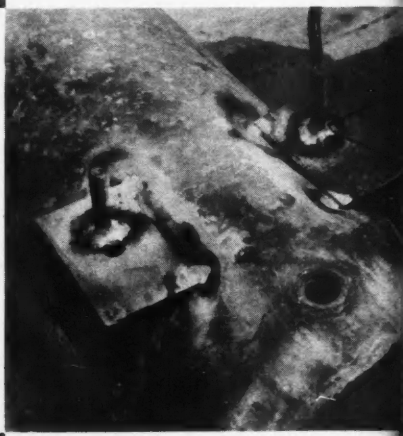
1. Brackets for the bottom side of the tank, or for casters if desired, are of 3" angle iron. Four of these are necessary, each being about 4 to 5 inches in length. Holes shown are for mounting the casters. If a stationary unit is desired, omit these. Cut two lengths of 1-inch angle-iron the length, or close to it, of the tank to be used. These are used to mount the compressor or cylinder unit and motor.

2. Check all existing outlets first to see if there are enough, three being necessary. Most home type water heaters usually have four or five. Place one of the outlets, found on the side, directly upward. This will eventually be the bottom of the tank, and the outlet will be for bleeding off condensation or moisture which develops in the tank. Visually aligning for levelness, scribe or chalk where angle-iron brackets will be brazed or welded to tank.

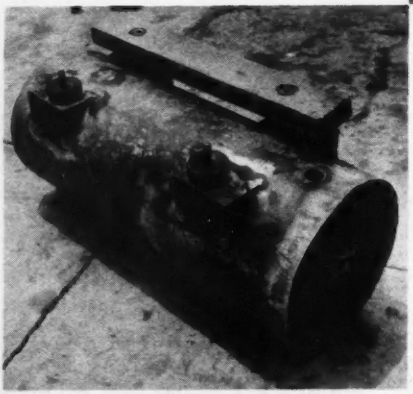
3. By the use of either a grinder or hand file, remove galvanize from area where brazing is to take place. Incidentally do not waste a lot of time looking for a hot water heater core that isn't galvanized. If you have access to an arc-welder this is acceptable.

CONTINUED

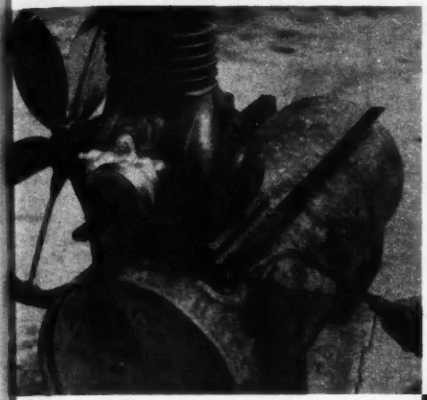
4. Welding or brazing of the full length of the angle iron bracket is not necessary, an inch on each corner or end will suffice. Leave all outlets unplugged while welding. With the brackets on one end of tank, hold straight edge along side to align brackets on opposite end.



5. If casters are to be used, holes should be at least 2 in. from studs. Half-inch studs were cut to length for Ford motor mount pads and the thickness of a 2 by 4 board. Note moisture drain opening.

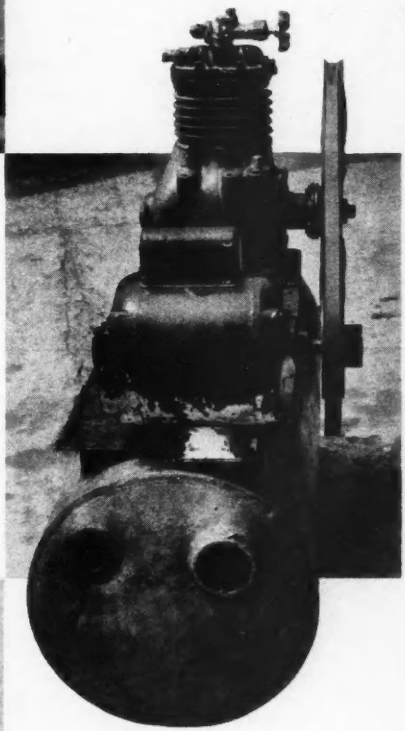


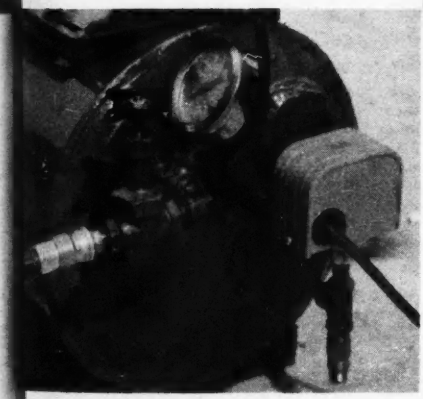
6. For stationary mounting of unit, four Ford motor pads were dropped over studs, then two 2 by 4's drilled and counter drilled for flat washers and nuts. Any sort of cushioning will suffice to keep unit from vibrating about the shop floor while in use. Installation shown performed better than expected. Clearance for moisture drain petcock is now evident.



7. Drilling mounting holes in two strips for mounting the compressor unit is done before they are welded to tank. Unit is then fastened to strips, and put into proper position on top side of tank. Doing it this way allows an over-all visual check for clearances for pulleys and position. Again small sections of welding will do.

8. With strips welded to tank, set motor into its proper position, and by using the drive belt, visually align as shown prior to drilling mounting screw holes for motor. Large hole in end of tank was originally for heat to travel through. Upon final check for leaks, and if the two openings (one in each end) allow air to escape, two caps will have to be made and welded over the holes. Otherwise holes may be left uncapped.





9. Automatic switch installation, note safety valve directed downwards. Switch is on the motor end of tank for convenience of wiring.

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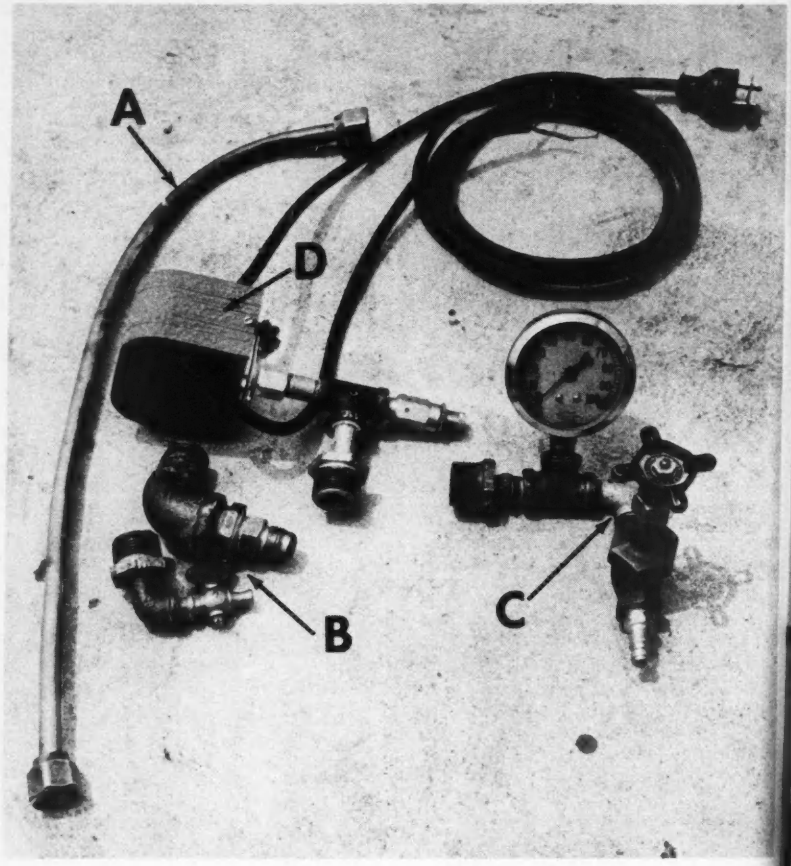
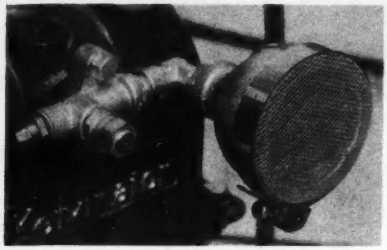
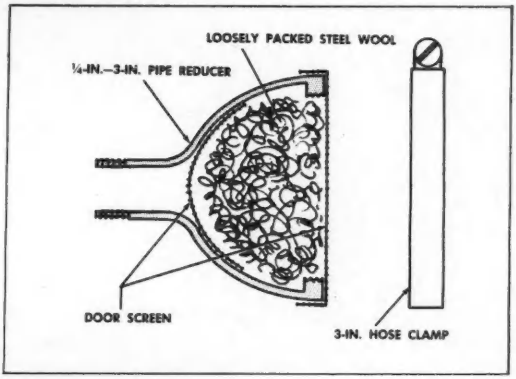
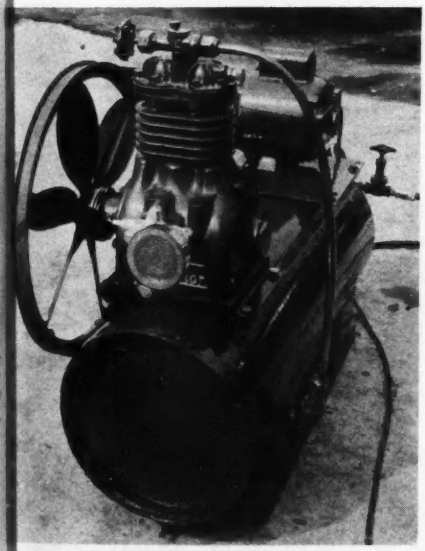


10. Newly purchased parts include: A—Necessary amount of ½" copper tubing to go from compressor unit to side of tank; B—Petcock valve for draining moisture from tank; C—100 lb. gauge (all that's necessary), screw type valve for turning off air with quick type connector for hose attachment; D—To make a more professionally manufactured unit, a pressure switch was purchased for $5.00. This makes unit automatic so that it will start by itself when the pressure goes down to 50 PSI and turn off by itself when pressure in tank reaches 75 PSI.



11. Air intake for cylinders is usually much smaller. By using a ¼ inch to 3 inch pipe reducer an excellent air filter was fabricated. See diagram.



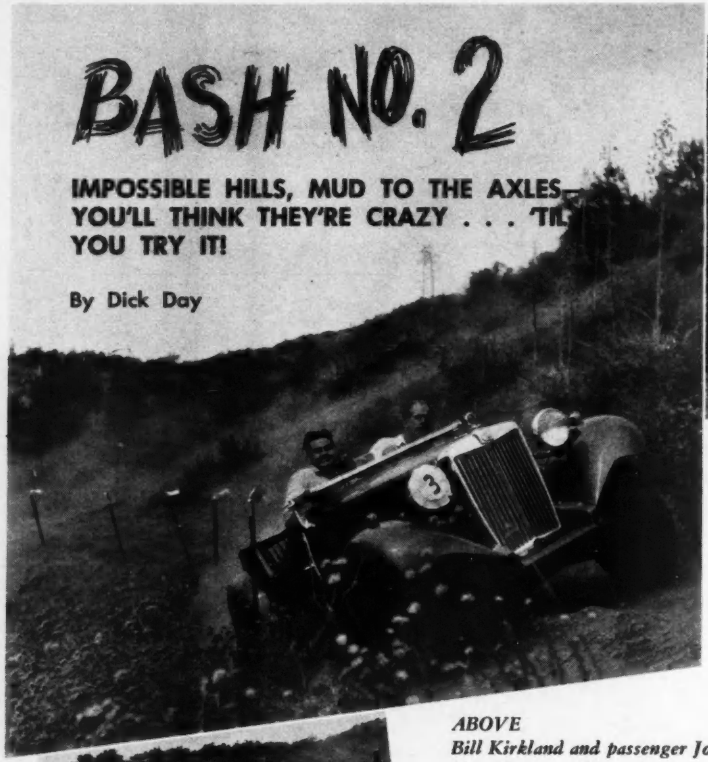


12. Valve located on top of cylinder head may have to be used on some models which do not have flutter valves. This prevents air from tank backing up through pistons, causing a drop in pressure. Completed unit painted bright red makes a neat addition to the work shop. If there are any "Lil' Beeps" in the family a guard should be made to keep inquisitive fingers out of the wheels of progress.

BASH NO. 2

IMPOSSIBLE HILLS, MUD TO THE AXLES— YOU'LL THINK THEY'RE CRAZY . . . 'TIL YOU TRY IT!

By Dick Day

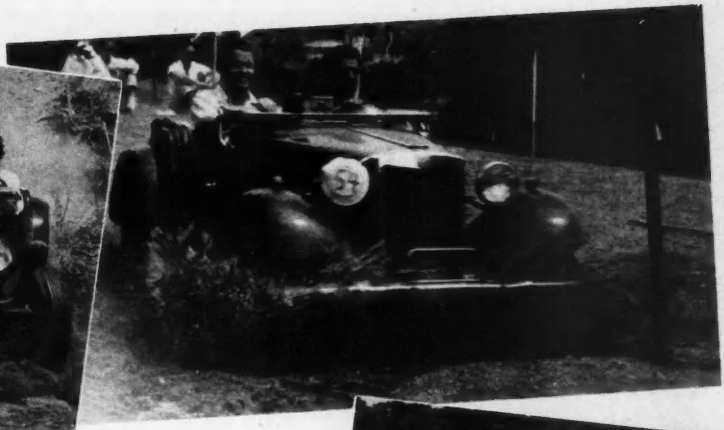


Frank Aldhouse, special class winner, tediously maneuvers loose uphill climb. Too much throttle here would break traction and slide car from course, losing points.

ABOVE
Bill Kirkland and passenger John Lumkin display their winning style on a very wrong cambered section. Ten rugged hazards made up the course.

LOWER RIGHT
This contestant played hot shoe at wrong corner; he slid off course, then sideways into mud hole, losing precious points. Entries numbered in the thirties, with varying types of equipment.

FAR RIGHT
Several uphill sections required the mustering of all power possible to reach top. Phil Garber's MG got slightly airborne in doing so, despite size.



ABOVE LEFT
Merl Francisco skillfully oozes through one of three mudholes that were found among the ten hazards. Event was staged by MG Club of America.

ABOVE RIGHT
D. Nolan plows through the gooey stuff. Winner Kirkland won event with 968 points lost. Another event is scheduled for late fall.

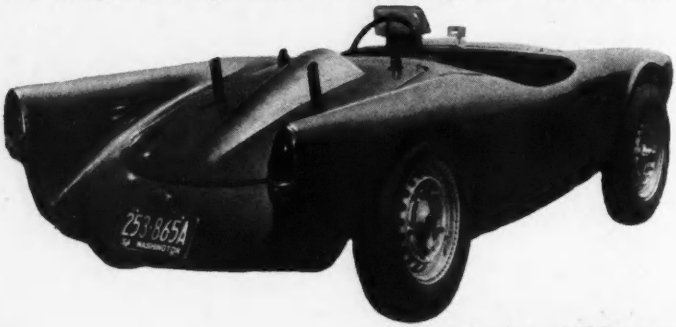
RIGHT
Garnett and Roath's special-built trials car did not compete legally but ran course anyway. Car's handling and Merc powerplant were the greatest and will undoubtedly prove a winning combination in future.

Photos by Medley, Brollier

Northwest Natural

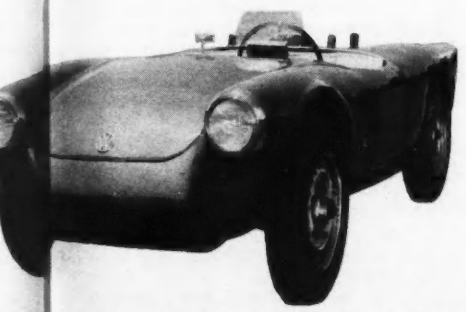
Small-Bore Stormer

Pete Lovely slams through a corner ahead of Al Coppel's OSCA on the Golden Gate course.



Rear view shows sleek line over engine compartment. Fenders terminate in Nash lights.

Photos by Bob D'Olivo



Nose compartment holds the spare tire, fuel tanks and driver's legs. Lid opens forward.

A NUMBER of years back, when Hitler was making noises like a dictator in Germany, one of the gimmicks he used to keep folks happy while being pushed around was a plan to put every family into a car. This, in itself, was revolutionary thought for Middle Europe, bicycles being about the epitome of transportation for the average guy.

Just as revolutionary, however, was the car that was to be provided. A bug-like, rear engine job of just over 70 cubic inches was designed by Ferdinand Porsche, builder of the fabulous Auto Union race cars. However, a slight disruption in the form of World War II caused a change in plan and the "People's Car" production was turned over to making the German version of the Jeep.

After the war, production was started again, this time for export to help pay reparations. Meanwhile, Porsche, in prison for his part in Nazi war production, had designed a very healthy sports version, similar in basic plan but shorter, much more powerful and with a streamlined body, the car that was to bear the Porsche name.

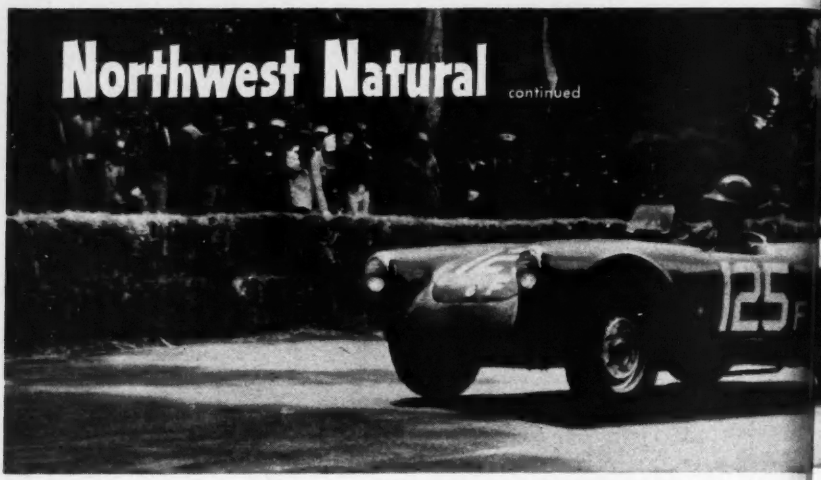
Now, eight years later, both the Porsche and the Volkswagen have become common in the United States, common enough so that there are plenty of each on the used car market and some few in wrecking yards. What would be more natural than to mate the inexpensive VW components to the very healthy Porsche Super 91-inch engine? All that would be needed would be the VW running gear, transmission and steering layout, plus the Porsche mill.

This was the thinking that led Pete Lovely, former roadster pilot and ace mechanic, of Seattle, Washington, and Dr. Dean Johnson of the same city to team up on a race car project. One thing had to be taken into consideration besides cost—the car must be capable of being driven on the street as well as in competition.

With the engine hanging out behind the rear axle in the original cars, both the Porsche and the VW had the tendency to swap ends when pushed into a hard corner or wheeled exuberantly on wet pavement.

Porsche had solved this problem for the 1953 Mexican Road Race by reversing engine and transmission bringing the heavy weight of the engine in front of the axle and put-

(*Continued on next page*)



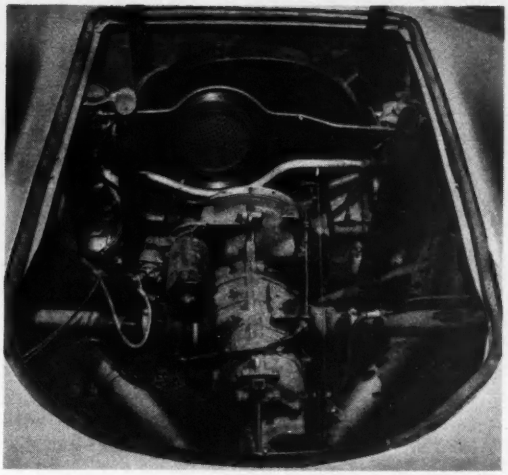
Another view of the Porsche-Wagen in tight corner. Car rides almost perfectly flat.

ting the gearbox behind. Lovely decided to do the same thing. Being the kind of guy who thinks before he acts, Pete lived in close friendship with the Porsche engine and VW gearbox. He discovered that they mate perfectly and also that the transmission could be turned end for end and side for side without trouble. The only thing that had to be done to make it work perfectly was to switch the ring gear from one side to the other so that the thing wouldn't go full-bore in reverse.

With that little problem settled, the job of manufacturing some method of tying everything together in the form of a chassis had to be tackled. Side rails of 2½ inch chrome moly tubing were made up and tied together with crossmembers of the same material and diameter. A roll bar and cowl bar were also made of the 2½ inch material. The ends were adapted to take the VW front and rear suspension units, trailing arms tied together by square torsion bars made up of flat leaves and set transversely across the chassis. All hangers and swinging arms were pirated from the Volkswagen, as were brakes, axles, wheels and linkage for both transmission and control pedals. Even the steering came from the VW. The only parts that are Porsche were the engine and final drive gears which have a ratio of 3.54 to 1. The engine was left strictly stock, but since the Super engine doesn't really begin to run until it's cranking on in the neighborhood of 4500 to 6000 rpm, it was considered adequate to handle the job. This point was proven when the car blew off one OSCA and crowded another across the finish at Golden Gate to cop second spot in the under-1500 cc main event. The OSCA, need it be said, is Italy's answer to the 91-inch Offie.

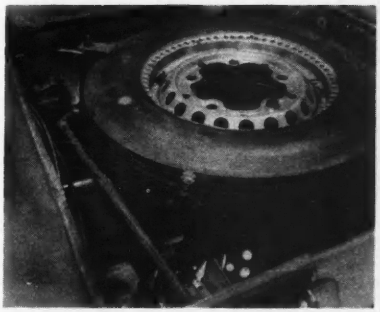
The next task was a body. This was farmed out to a local custom body shop. The idea was to wrap up the package in an aluminum skin with as few extraneous lumps and gadgets as possible. The result was just that, the whole car being enclosed in a neat, streamlined envelope and nothing more.

Since the car is a rear engined beastie, the whole front end was available for any extra or added items. The required spare tire and a double fuel tank went in there, leaving plenty of room for both driver and a passenger, space for whom, in the average "special" is at best a token bow to the rules and at worst a device that would cripple anything but a contortionist. The dash is merely a small hanging bracket supporting a VW instrument-speedometer group plus an oil heat gauge. The seat is a comfortable bench-type goodie, holding two people comfortable. To prove just *how* comfortable, Pete and a bud-

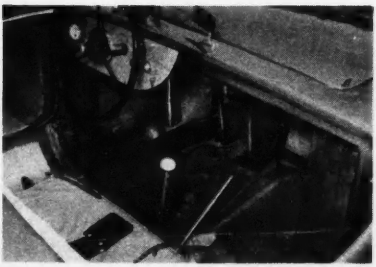


Engine is placed in front of rear axle for better balance.

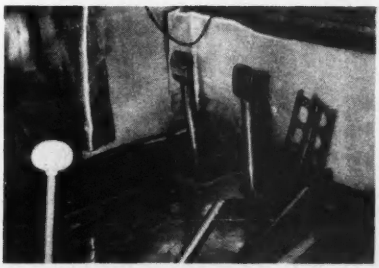
dy drove the car down to San Francisco from Seattle to enter in the Golden Gate race. Although the car had just been completed hours before the start of the trip and it rained for most of the 1000-odd miles, the little blue bomb made it without incident except for a tendency to blow off the makeshift muffler system attached at the last moment to the racing type exhaust stacks. To top off the trip, the car went through technical inspection without a hitch and then proceeded to shellac the wheels off all but the one OSCA in its own event. Just to make things stick, Pete also entered the main event for the big-bore jobs and came in among the first 10 finishers! Not bad for a maiden voyage.



Spare tire rides under the front deck. Rim and disc have been drilled for lightness.



Cockpit is extremely simple. All instruments and controls were pirated from Volks.



Pedals were made from tubing and sheet stock for lightness. Cables were from VW.

This is talent? **HONKER** by Dick Day

..IT ALL STARTED AT THE AGE OF TWO WITH THE FAMILIAR **MUD PIES**–

..AT 10 YEARS, IT WAS **DRIP CASTLES** AT THE LOCAL BEACH–

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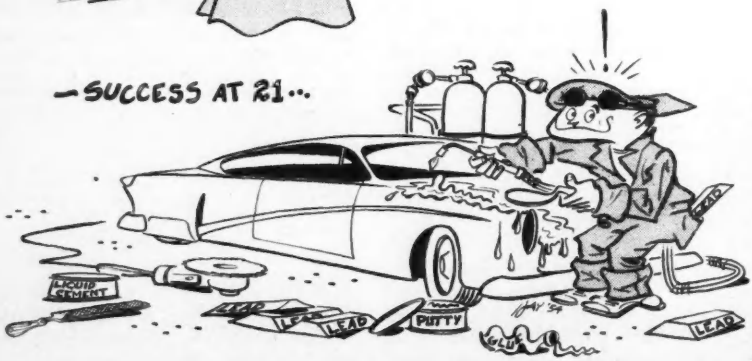

THE COMPETITION ENGINE

(*Continued from page 47*)

At this point, plus or minus 500 rpm, the necessary spark advance will reach its maximum point and remain constant through the remainder of the speed range. For this check, the automatic advance mechanism should be rendered inoperative to prevent mysterious and sometimes inconsistent errors from creeping in. With the required spark advance figures obtained in this manner, a corresponding advance curve should be plotted on graph paper as a permanent record. Then the curve can be worked out by adjustments to the spring tension and/or rotating weights of the automatic advance mechanism in the distributor. Once the shape of the distributor advance curve closely duplicates the shape of the required advance curve, it merely becomes a matter of adjusting the initial spark advance to fire at the correct point, with the distributor mounted on the engine.

With an engine of this type, a good, simple advance mechanism actuated by spring tension and/or centrifugal weights can be made to duplicate almost any advance curve and should be used in preference to a distributor in which the spark advance is controlled, totally or in part, by intake manifold vacuum. This is because manifold vacuum conditions are not necessarily any indication as to spark advance requirements for a competition engine that is to be run mostly at full throttle and load.

With an engine and a competition event that requires an advance curve, the curve must be plotted as described to obtain maximum power under full throttle, full load conditions. If this is done, detonation or pre-ignition arising from excessive spark advance will be ruled out of the picture because best power is nearly always obtained just before detonation starts. If we desired, the spark advance curve could be set to produce maximum power at half-throttle position, or to give maximum economy, but if full power were required, detonation would surely result from excessive advance at full throttle and load. We must bear in mind that at best, a mechanically controlled advance curve is strictly an item of compromise; there are other variables, especially during

(*Continued on page 65*)

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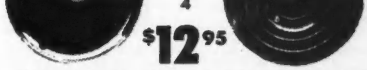

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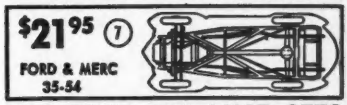

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THE CHEVY CAPER

(*Continued from page 15*)

final .015 inch of depth. Due to interference with the cylinder walls with valve open, it is not recommended that you use valves of over 1 13/16 inch bore. When boring over standard size, the valve head diameter may be increased over 1 13/16 inch by the amount of the bore increase. (See the previous issue of CAR CRAFT, Room to Breathe, II.) Throat diameters may be increased by the methods described in our previous article, maintaining smooth contours, concentric with the valve seat where they blend. Possibly, if you have not had extensive porting experience, the most satisfactory method of throat enlargement would be the use of a 70° reamer on a 11/32 inch pilot.

Chevrolet specifies all seats at 30 degrees, through 1948. Leave 'em that way, if you like 'em that way, but we'll take ours at 45 degrees. There are two reasons for this, better flow when the intake valve is "sunk," and better seating. We also recommend cutting off all guides flush with the passages. Complaints of oil consumption as a result of shortening the bushings have come to our attention on both late Buicks and Chevs. However, we wonder how carefully seat runouts, guide to stem clearances, and rocker thrust were checked, upon assembly. Any of these could account for an increase in oil consumption via the intake guides. Intake seat warpage is a problem on most modified Chevs and the 45 degree seats might effect some improvement in this condition. Stock Chev exhaust valves are not ideal as neither the alloy nor their weight is in their favor. Use of G.M.C. #270 exhaust valves is suggested, carefully lightened by cupping and grinding beneath the head at 20 degrees. The stock Powerglide intakes weigh about 120 grams and the exhausts, about 100 grams. Without going extreme, we reduced the intakes to 105 grams and the exhausts to 87 grams. This alone is a greater weight reduction than could be produced by magnesium rockers! Remember that any weight saved at the valve is worth 1.4 times weight saved on the pushrod side.

Head—Intake Porting at the Manifold

Use of a 1 5/16 inch shell reamer is the quickest way to enlarge the intake ports inside the head. If you are using the early 1937-40 head, some additional material can be reamed out at this point. We don't suggest that you ream larger than 1 3/8 inches, tapering, if possible, when a depth into the head of over 1½ inches is reached. The ports should be accurately matched with whatever manifold is to be used. Leave nothing to chance at this point, the care will pay off!

We do not recommend the removal of the internal fluid dams or "crow-feet" from the internal passage branches. These, along with passage offset, promote a desirable mixture swirl which certainly won't hurt induction characteristics. Naturally, any casting protrusions or irregularities should be removed, particularly around the exhaust valve guide boss.

Valve Gear and Camshaft

Under our ground rules for "Conservative," we feel that a 270 degree duration cam with about .370 inch lift at the valve or .255 *at the cam* will fulfill all requirements for lively performance. Any cam of more extreme duration will begin to sacrifice desirable and usable low rpm torque characteristics. Proper selection of gear ratios and tire sizes will allow you to surprise owners of much more impressive monsters without resorting to peak revs of over 5500-5700 rpm. We think that rpm for its own sake is assinine when you pay through the nose in horsepower to pull those 300 pound-when-open valve springs. Accordingly, we recommend single springs, such as the 1948 Cad springs, which will show abut 180 pounds at a test length of 1.45 inches, their length when used with a .255 inch lift cam. *Do not* use high lift rockers with this cam! Tubular pushrods are desirable to further improve the valve train. These should be trimmed to the proper length to allow rocker adjusting screw travel, if your head milling has been over .090 inch. Use only cam followers that are in A-1 condition and check them at intervals later for wear. This wear can be detected by laying your finger on the rocker adjusting screw with the engine running, and feeling for roughness transmitted through the pushrod as the valve opens and closes.

External Breathing

Definitely recommended by us for more go are the dual exhaust conversions available,

particularly if they employ provisions for manifold heat with a suitable intake manifold. Our idea of intake manifolding adequate for our Conservative (?) category would be the dual down draft types. For the ultra-conservative, the Rochester $1\frac{11}{32}$ inch venturi will do the trick but yet starve at maximum revs. If you are going to buy two carbs anyhow, we suggest you look into the possibilities of the late Holley glass-bowl used on International pickups. Mixture ratio corrections are much more easily accomplished with the jets available for the Holly than either the Rochester or Carter types. The 1954 Ford Six Holley, with a $1\frac{3}{8}$ inch venturi, could be adapted by plugging the venturi vacuum hole to operate the distributor advance properly. Prices on the Ford carbs might be cheaper than the IHC models, providing you Chev fiends can stoop to such treason as the use of a Ford part. Whatever carburetion you decide to use, check mixture ratios under varying conditions, preferably on a dyno. Dual carbs can be worse than a bad single one if not properly jetted and synchronized!

Final Cautions

When assembling any lower end, first blow out or swab out all oil passages. Even new blocks contain machine chips which may wreck your valuable engine. Back off all valve adjusting screws before installing the rocker assemblies to avoid bending the push-rods. Check all valve springs for coil bottoming by rotating the engine slowly by hand.

On installing the oil pump, set the locating set screw just tight, then *back it off* just ¼ turn. Otherwise, if left tight, it will wear the drive gear on the camshaft.

Above all else, make sure that your engine is in top shape before putting expensive equipment on the top end. A good bottom end plus minor changes at the top will give far more satisfaction and better performance at less cost than all the expensive 12-port heads in the world placed on top of a bunch of loose bearings, leaky oil lines and sloppy piston assemblies. Do it right the first time and you'll have a bomb. Next month we take up the full-bore competition Chev and GMC. If you've a yen for flat-out competition, don't miss this one.

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WELDING IS EASY

(*Continued from page 23*)

nozzle before it burns. At this point you are adjusting the flame for the heat range. The acetylene is the combustible material and the oxygen provides the variation in heat. The two must work together to provide the correct heat.

When the flame is burning with a gap between the nozzle and the flame of about ⅛ inch, slowly open the oxygen valve. You will then notice a two-sided flame. The acetylene will burn with a long cone-shaped flame and the oxygen will burn with an inner, more blue flame. Adjust the oxygen valve till the two cones unite. Always use the oxygen to adjust the flame. If the cone seems too long, it should be about ⅛ to ¼ inch, close the oxygen and shorten the acetylene flame, then readjust the oxygen.

To weld, assume a position which is comfortable. Hold the torch in either hand. If you are right handed, hold the torch in your right hand and the rod in your left. If you are right handed, for example, push the flame toward the left. Do not draw the flame, push it across the metal and insert the rod into the center of the flame.

Hold the torch loosely between your thumb and fore finger, steadying it with your other fingers. Direct the flame toward the metal until, through your goggles, you can see the metal become molten. Do not get the flame too close to the metal or it will burn a hole in it. If you hold the flame too far from the metal it will not become molten throughout its depth.

When the metal becomes molten insert the rod into the puddle of molten metal. Do not drop the rod from the flame, but insert the rod into the puddle. You will see the rod melt and deposit a ball of metal into the puddle. This can be directed by the torch tip. If you work the rod in a circular motion as you melt the metal you can deposit a clean line of metal along the seam.

You will not become an expert welder with one try. You must practice. Cut several small 3-inch squares of sheet metal and practice welding these.

Place two plates end to end. It is a good idea to tack the two edges before you begin welding. Hold the torch over one end and direct the flame at the two edges till they are molten. Then, insert the rod and melt a tiny drop into the center of the puddle. It will be noticed that as the metal begins to glow it starts to glisten as if it were sweating. This is a sign the metal is ready to melt. Apply the rod and work the small drop into the puddle. Remove the rod and continue to play the torch over the puddle till it is about ⅛ inch in size. Then, remove the torch and let the metal cool. Repeat this on the other end and the piece is then tacked.

When you have mastered the art of welding a straight butt-joint place the metals at right angles and practice welding a corner. Try welding from both the outside and the inside areas. A corner weld is best if you can work from the inside since it adds a little "V" to the metal for strength, but often this is impossible and you should be able to weld from all positions.

Keep trying to weld in clean, small half-circle strips. When you reach the point at which your "bead" is straight, of the same size and composed of equidistant semi-circles you are a good welder.

Rod

Like welding tips, welding rod comes in different types and sizes. The rod size should be determined by the thickness of the metal you are welding and the type should be dictated by the kind of metal you are welding. The rod thickness, whenever possible, should be nearly equal to the thickness of the metal you are welding. The rod composition should be identical to the metal you are welding, except in the case of brazing.

Many amateurs boast about welding with a coat hanger. It can be done, but the metal used in making coat hangers has little tensile strength and the joint will not hold. Use steel rod for welding steel, aluminum rod for aluminum and so on. Even though you may not be brazing, some compositions require the use of flux for a good union. Here is a table of rod composition and the flux you should use:

Metal	Type of Weld	Rod to Use	Flux Used
steel	fusion-weld	high-test steel	none
steel pipe	fusion-weld	high-test steel	none
steel plate	fusion-weld	high-test steel	none
carbon steel	fusion-weld	high-test steel	none
steel plate	bronze-weld	bronze	bronze flux
cast iron	fusion-weld	cast iron	ferrous flux
cast iron	bronze-weld	bronze	bronze flux
chrome-nickel	fusion-weld	nickel-steel	chrome flux

THE COMPETITION ENGINE

(*Continued from page 61*)

part-throttle operation, that have an influence on combustion besides spark intensity and timing. Most important among these is the fuel/air mixture ratio, which will vary somewhat from the desired "ideal" in spite of ourselves and the best in carburetion. Therefore, timing the spark to produce maximum power during full load, full throttle operation at varying engine speeds in a competition engine offers the best compromise and one which will not detract too much from part-throttle operation.

Perhaps the foregoing seems to haggle too much with seemingly unimportant details, but an engine's *required* spark advance characteristics are too often neglected or taken for granted. If a battery ignition system or a magneto is purchased that incorporates an advance mechanism, the odds are very favorable that the existing spark advance curve in the unit will very closely duplicate the factory specified curve for a completely stock ignition and engine. Factory specified curves always make allowances for combustion chamber deposits of at least 5,000 miles or so, poor grades of fuel, varying climatic conditions and so on. The resulting curves advance more slowly and to a lesser degree than for maximum performance. Reworking the curve so that the spark advances more rapidly and to the correct point for maximum power will pay big dividends in performance, even with a completely stock engine.

As usual, there is a compromise or two that must be met. If an engine's ignition timing is correct for best power output, it is good practice to retard it two or three crankshaft degrees. Lots of times, the ignition timing for best power may only be a hair's breadth from the point where detonation occurs and by retarding the timing two or three degrees, we give the engine an extra margin of safety and yet, power and performance will not be seriously affected. It's axiomatic that you can't win a race if you can't finish it, so why take a chance? I repeat, any form of detonation or pre-ignition or both are not to be gambled with; they are to be avoided at all costs!

The second compromise involves compression ratio. Engines using alcohol and/or nitro are not usually affected by compression ratios up to 12 or 13 to 1, but with gasoline, combustion chamber size and shape combine to place definite limits on compression ratio and the degree of spark advance. For the average modified Ford V8 or Merc street engine, a compression ratio of 8 to 1 should be considered maximum. For a "gas class" competition Ford V8 or Merc, the highest useful compression ratio is between 8½ and 8¾ to 1, provided the combustion chamber surfaces are kept free of deposits. An overhead valve street engine can usually use a compression ratio of about 8.3 to 1 effectively while the highest useful compression ratio of a competition overhead engine would fall around 9 to 1, again provided the combustion chamber surfaces are kept clean. These ratios may seem modest, but they allow optimum spark advance settings in most cases without detonation during prolonged full throttle running. The point is simply this: Tests on different bore, stroke, combustion chamber combinations on flatheads and overheads alike, show that for best power and performance, it makes better sense to sacrifice a little compression ratio in order to use full spark advance than to use the absolute maximum compression ratio for gasoline and have to retard the spark timing to avoid detonation. Hard to swallow? It was for me too, until I proved it to myself.

Choosing the type of available ignition equipment to do a specific job also plays an important part in the quest for superior engine performance. As in other matters, however, finances and personal preferences are likely to be more of an influence than making a deliberate choice. But the point is not to send a boy to do a man's job. For example, a Ford V8 or Merc engine to be used on the drag strips, straightaway courses, tracks or in boat races, the best choice would be a magneto with a "fixed" spark, such as Harman and Collins. While these units are made only for Ford and Mercs, they have been adapted to most other eight cylinder production type engines.

If an advance curve is a necessary item, then a Scintilla Vertex magneto may be used. The elements of the magneto proper in the Vertex are good, but unfortunately, the advance mechanism may give trouble. Before

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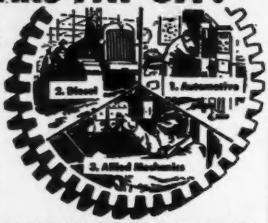

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(Continued from page 65)

purchasing a Vertex, I would recommend setting it up on a distributor testing machine and trying several different advance curves. Also, the most important point of any automatic advance mechanism is the ability to repeat its curve through many thousands of cycles. If there is any difficulty in repeating a curve, the trouble must be found and remedied or purchase of the unit should no longer be considered.

A magneto, besides inherently producing a high intensity spark at elevated engine speeds, has a further advantage in that no batteries are necessary to generate an ignition spark. In installations where weight is important, this feature precludes the necessity of hauling around a 40-pound automotive battery or the unreliability of a dry cell battery.

In the realm of battery ignition systems, there are several excellent types to choose from. For example, for Fords and Mercs requiring a "fixed" spark, a "Kong" dual point, dual coil distributor is good. For engines requiring an advance curve, a Spalding distributor or a converted Lincoln Zephyr would be suitable. For modified street engines, a Mallory "Magspark" will give a sizeable performance increase. The things to look for in any ignition system are ruggedness, proven dependability and simplicity. The purchase of an ignition system is a fulfillment of the old adage "You pays your money and you takes your choice," but make sure the choice is correct for the job at hand.

With the first phase of engine timing completed, the next step is the all-important process of choosing the correct carburetion layout for a competition engine, building and tuning a good set of alcohol and nitro carburetors. Some interesting points are covered that are necessary to stay out in front. Be sure you don't miss it!

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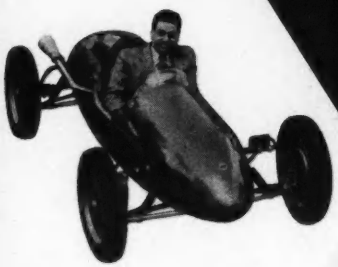

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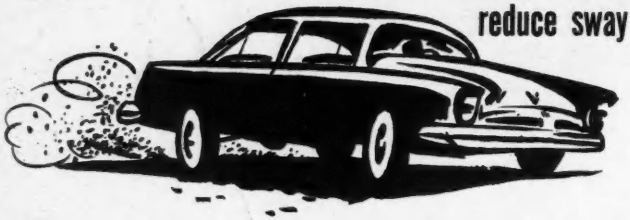

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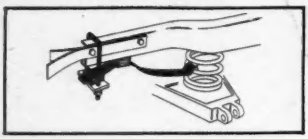

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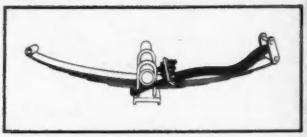

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